TUTORIAL

Materials, Shaders and Rendering tutorial

3ds max

Tuc-Tuc

Contents

Is our new precise, step-by-step tutorial which will begin with a vehicle model and cover the principals of applying shaders, placing it in a simple scene and following with a two-part section on both lighting and render. The tutorial will begin by creating and applying materials for the various parts of the car, such as glass, chrome and tyres, as well as texturing some simple geometry that will make up a scene. It will then move onto lighting where the focus will be on setting up a lighting rig and the various parameters connected to this. Finally the series will culminate with a section on render, where the aim will be to finish with a polished image. The schedule is as follows:

Chapter 01
Applying Materials & Shaders Part 1

Chapter 02
Applying Materials & Shaders Part 2

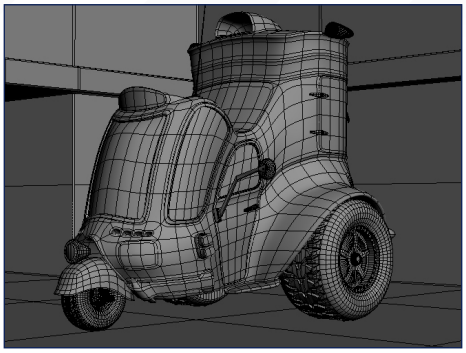
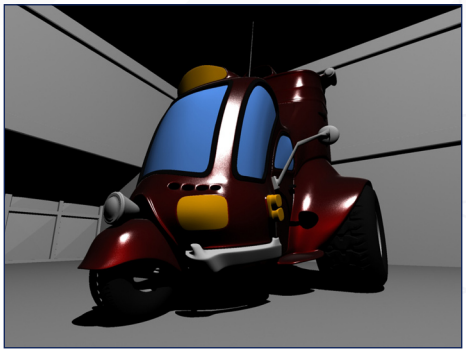
Chapter 03
Lighting Setup & Rig (with HDRI) Part 1

Chapter 04
Lighting Setup & Rig (with HDRI) Part 2

Chapter 05
Render Part 1

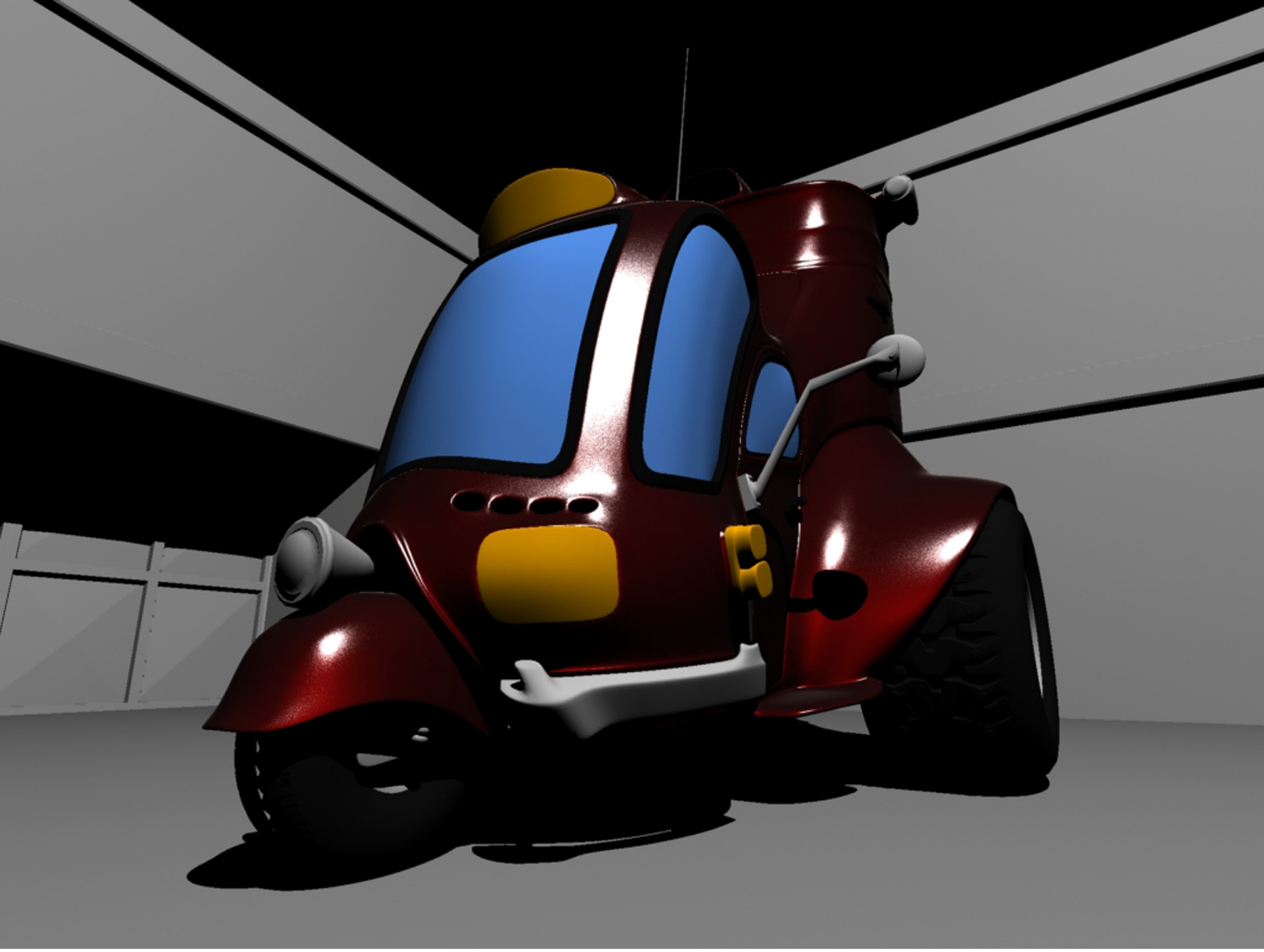
Chapter 06
Render Part 2

Enjoy ...





TUC-TUC

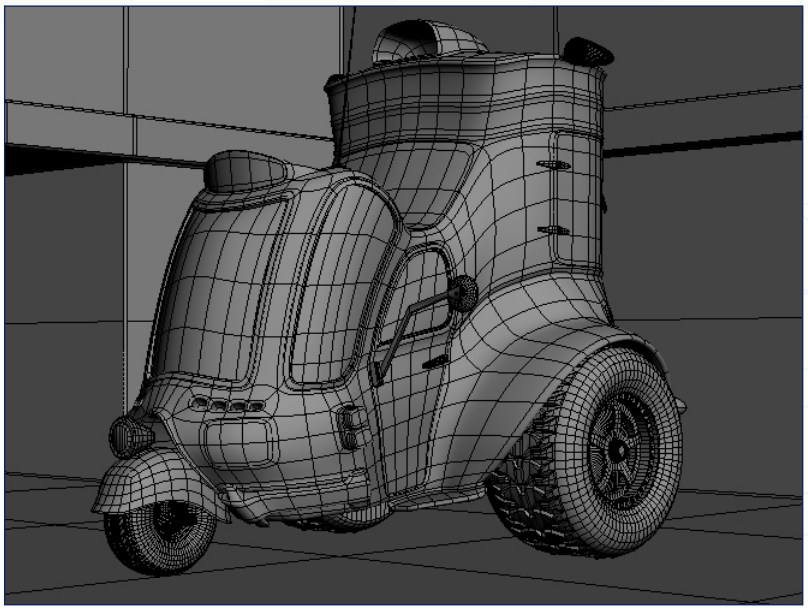
3ds max

Chapter 1:
Assigning Materials & Shaders - Part 1

Assigning Materials & Shaders - Part 1

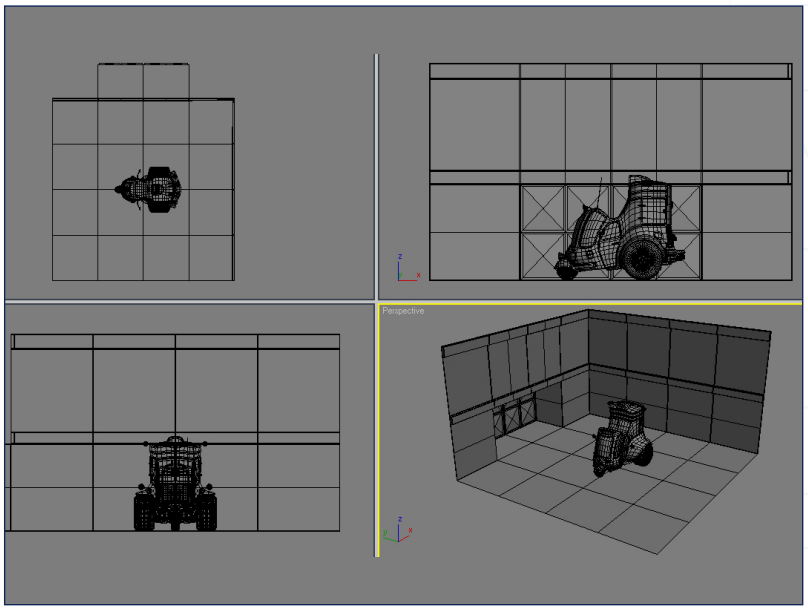
1. Here is our TucTuc vehicle model, put into a simple scene made by geometric objects, modelled with insets and extrusions (Fig.01).

Fig 01



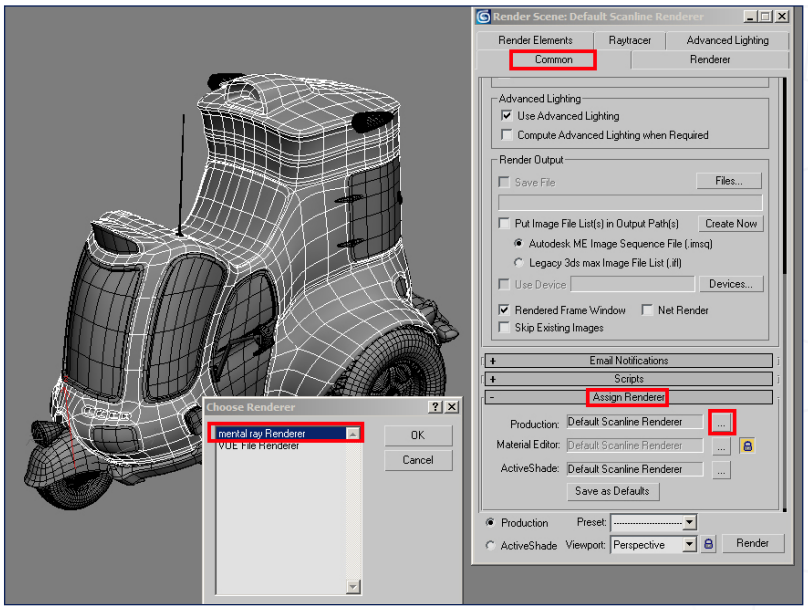
2. Let's have a closer look to how the scene is composed, viewing it from different angles (Fig.02).

Fig 02



3. We will use Mental Ray as renderer, so let's set 3DS Max to use it. Go to the rendering panel (F10 shortcut key), select the Common tab. Go to the Assign Renderer rollout and click on the three-dots button next to Production. Select Mental Ray renderer from the window that appears (Fig.03).

Fig 03



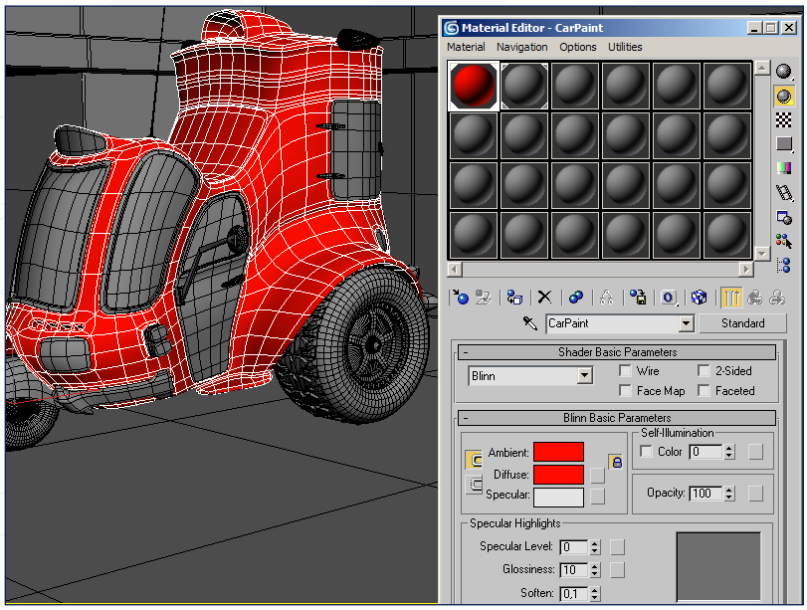


Fig 04

4. Now we can start creating and assigning materials to the vehicle components. First of all, create a “CarPaint” material. Set its colour to red (or whatever colour you like) and assign this material to the main body of the vehicle (Fig.04). Don’t forget to assign meaningful names to the materials you create, for clarity’s sake.

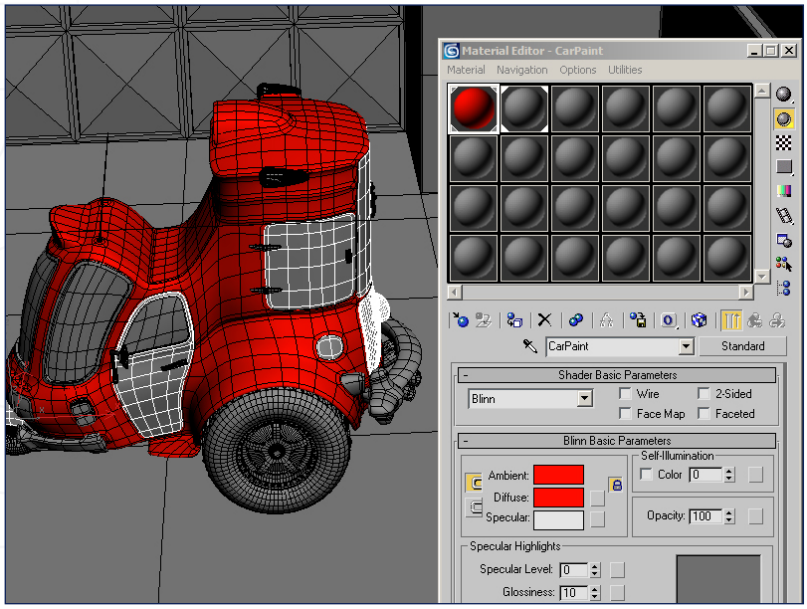


Fig 05

5. Select all the other components that will show the CarPaint material and assign it to them (Fig.05).

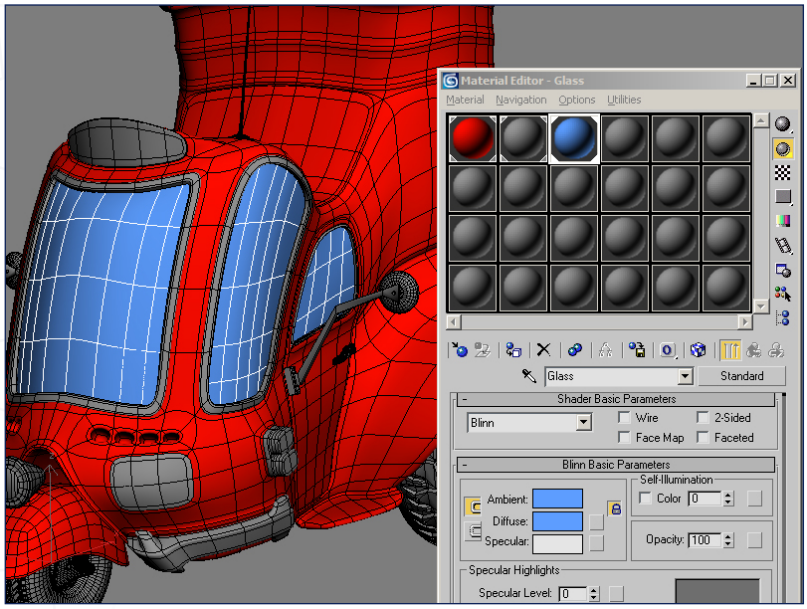
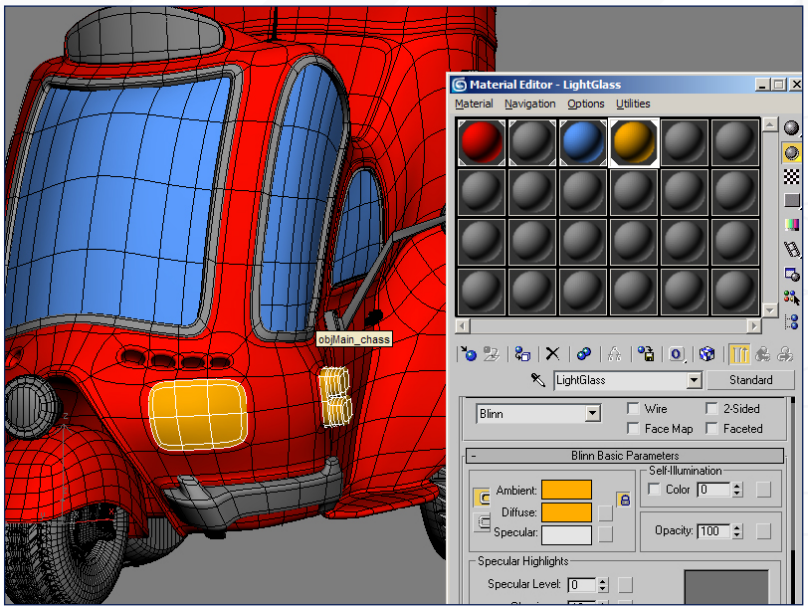


Fig 06

6. Select a new material slot, name it “Glass”, change its colour to something blue-ish and assign it to the glass object (Fig.06).

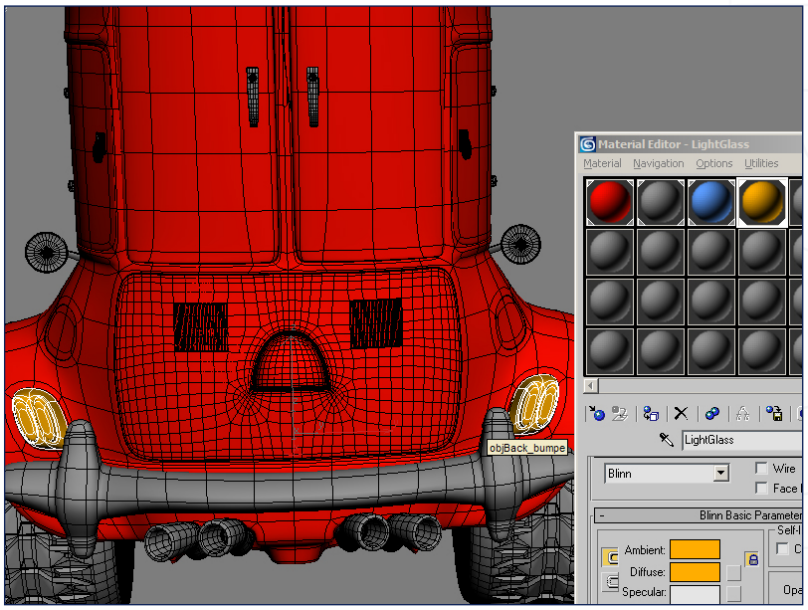
7. Now create a “LightGlass” material with an orange diffuse colour and assign it to the objects marked with the white wireframe in Fig.07.

Fig 07



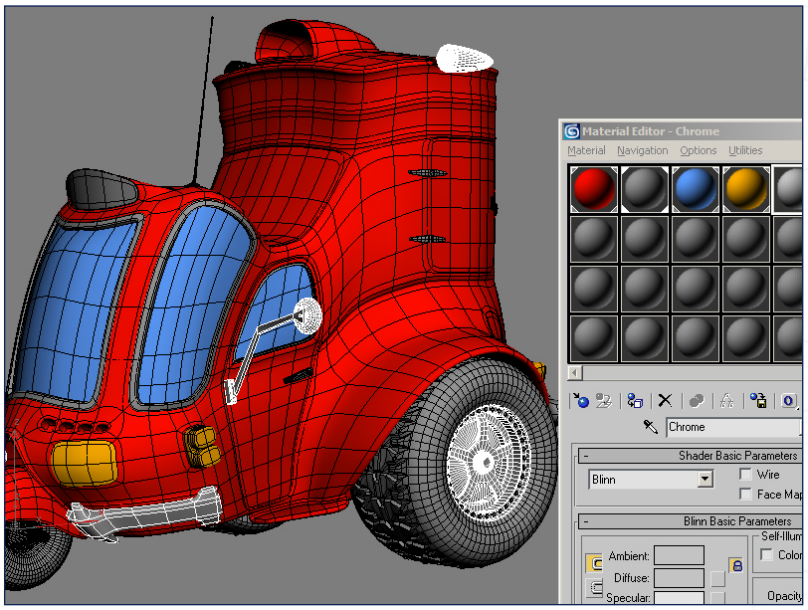
8. Don’t forget to assign the same LightGlass material to the back lights (Fig.08).

Fig 08



9. Select all the chromic parts of the vehicle and assign a light greyish “Chrome” material, like shown in Fig.09.

Fig 09



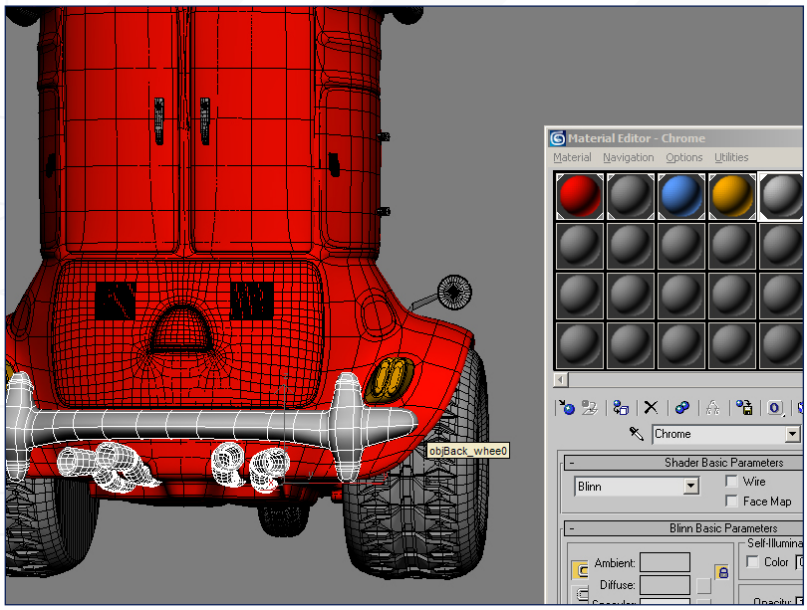


Fig 10

10. Once again, rotate the view around the model and check if there is any other component needing the Chrome material. If there is any, assign this material to it (Fig.10).

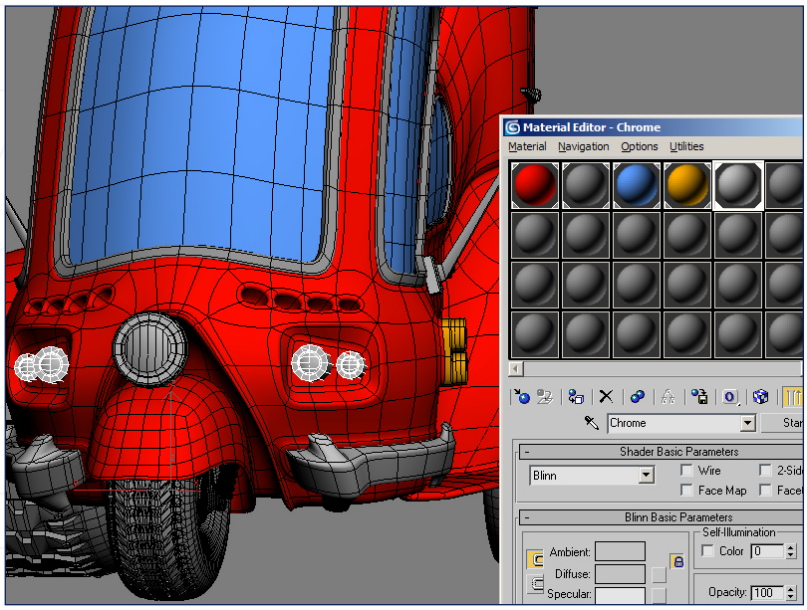


Fig 11

11. Hide the front light glass object and assign the Chrome material to the inner components of the front lights (Fig.11).

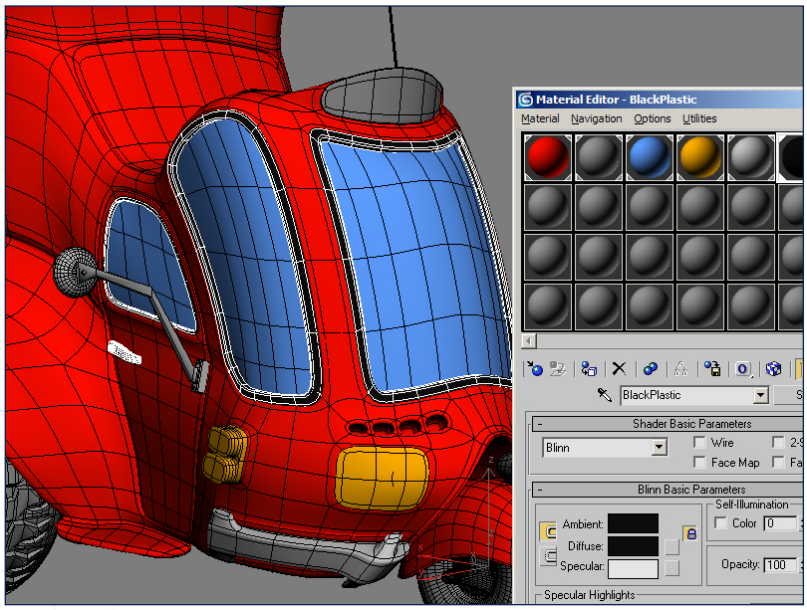
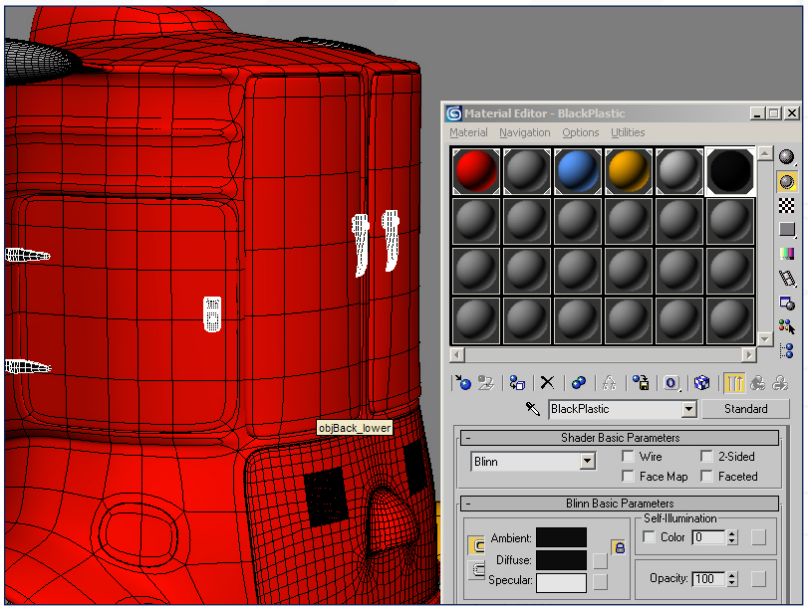


Fig 12

12. Create a new “BlackPlastic” material; give it a dark grey (almost black) colour and assign it to the objects shown in Fig.12.

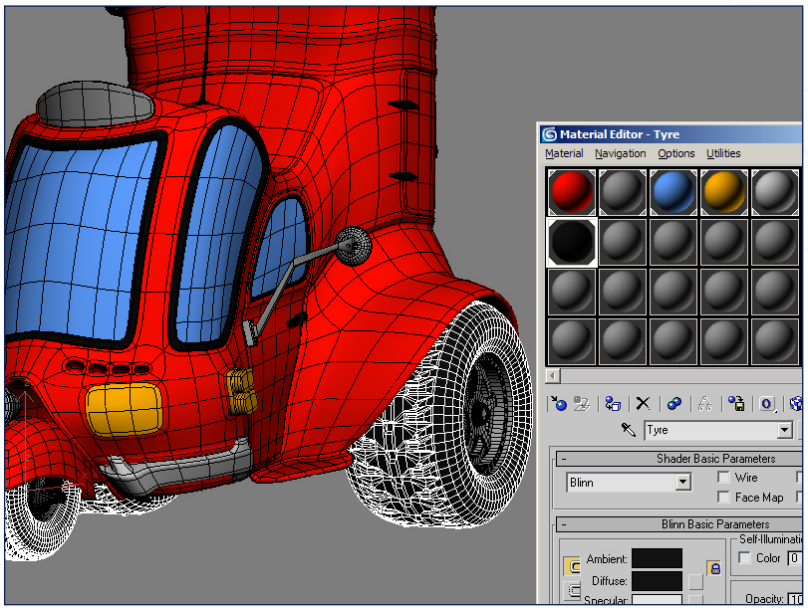
13. Rotate the view and assign the BlackPlastic material to these objects, too (Fig.13).

Fig 13



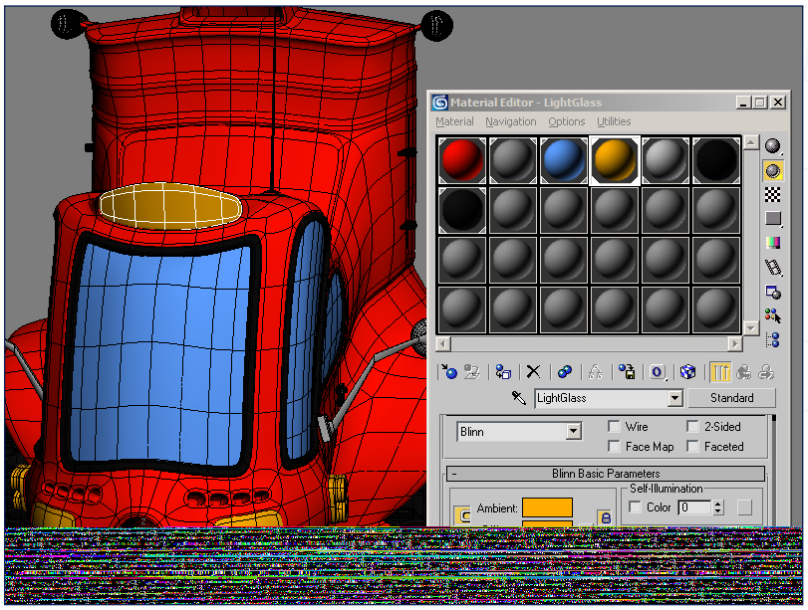
14. Create a dark grey (almost black) “Tyre” material and assign it to the three tyres in the scene (Fig.14).

Fig 14



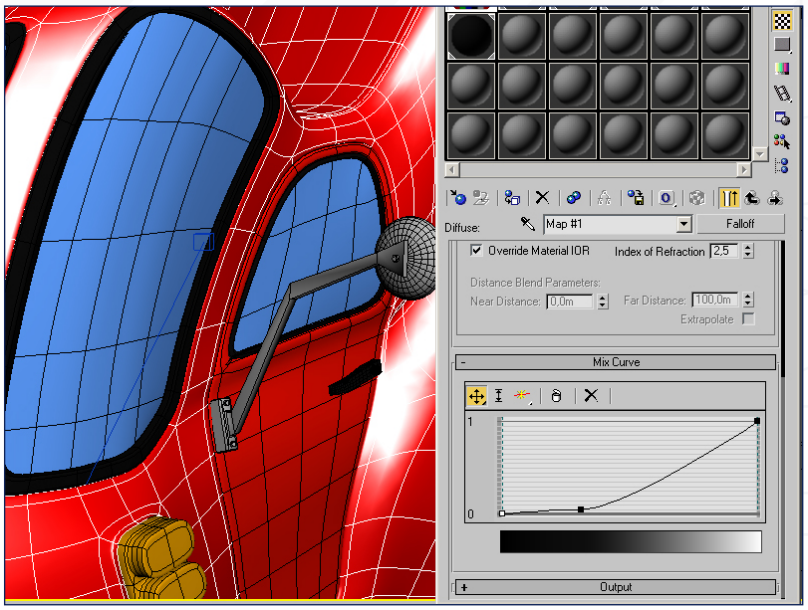
15. Assign the LightGlass material to the top-front light glass (Fig.15).

Fig 15



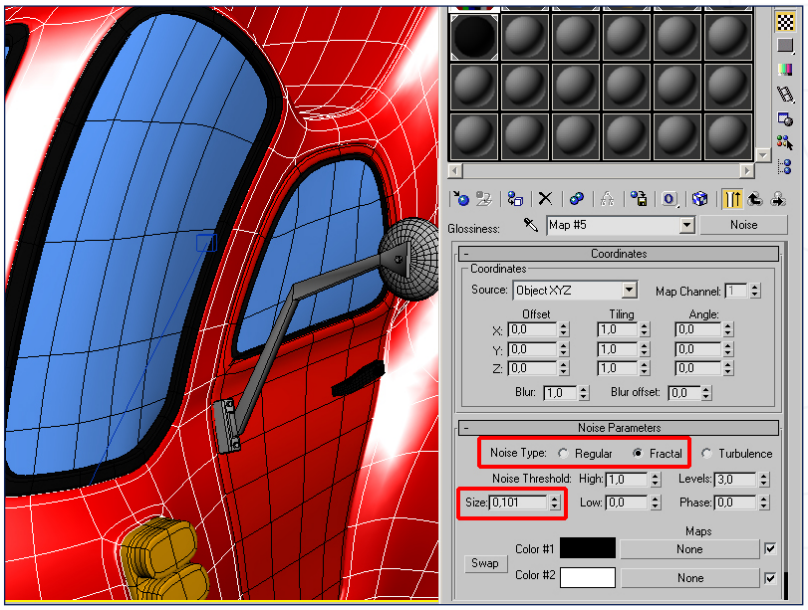
25. Click on the Diffuse slot and assign a Falloff map to it. Leave the default colours (black and white) and change the Mix curve to something similar to Fig.25.

Fig 25



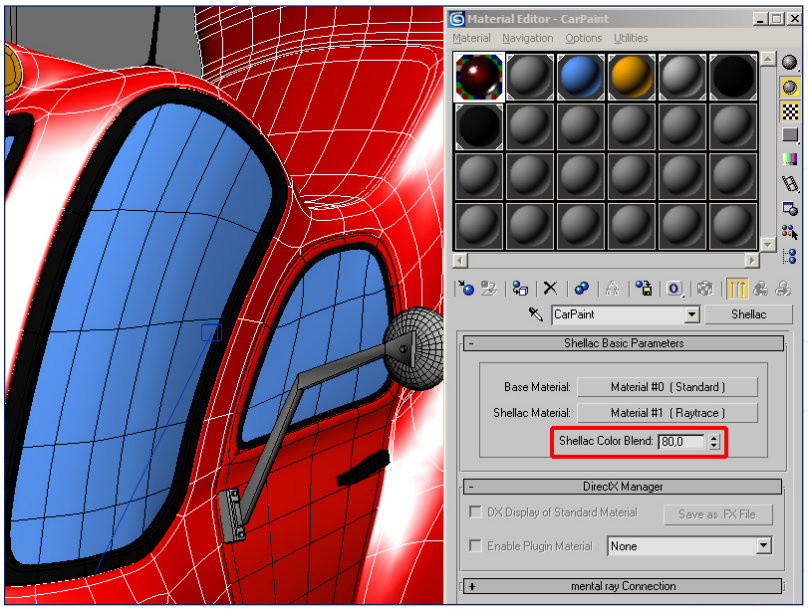
26. Go back to the root of Raytrace material and assign a Noise map to the Glossiness slot. Once again, set its type to Fractal and lower the size value. You have to try and find the right noise size for your scene. Use Fig.26 just as a reference for the Noise values.

Fig 26

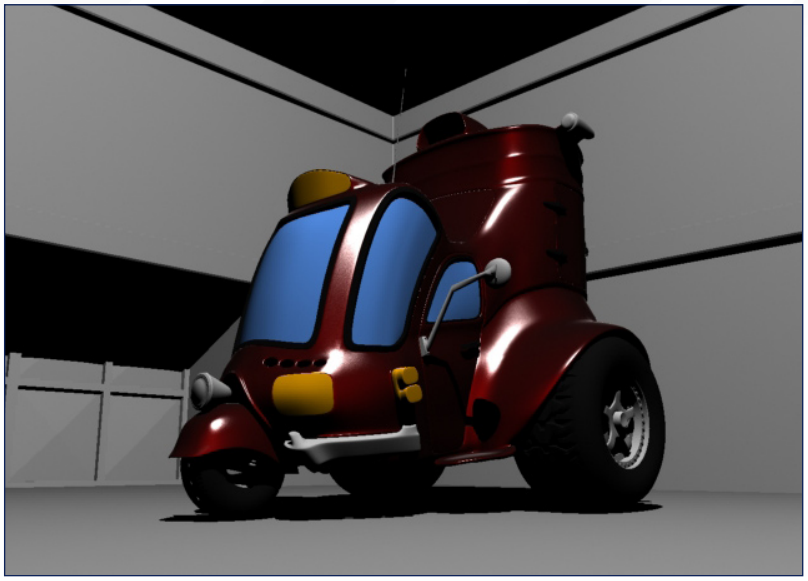


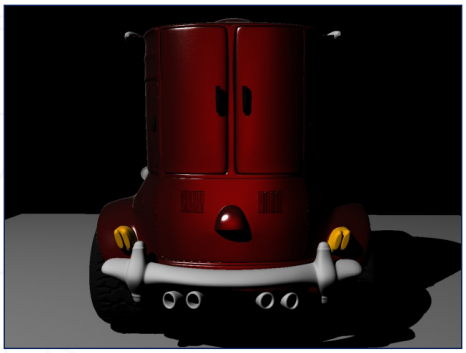
27. Go back to the Shellac material root and set the Shellac Colour Blend to a value of 80 (Fig.27).

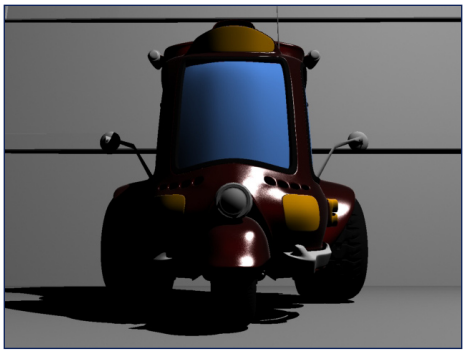
Fig 27

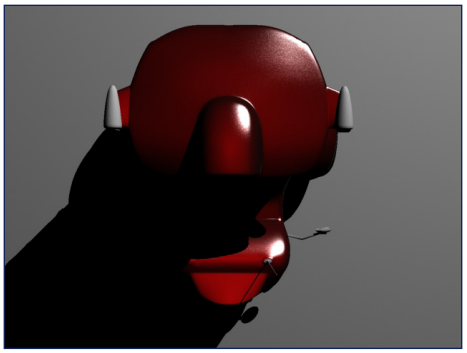


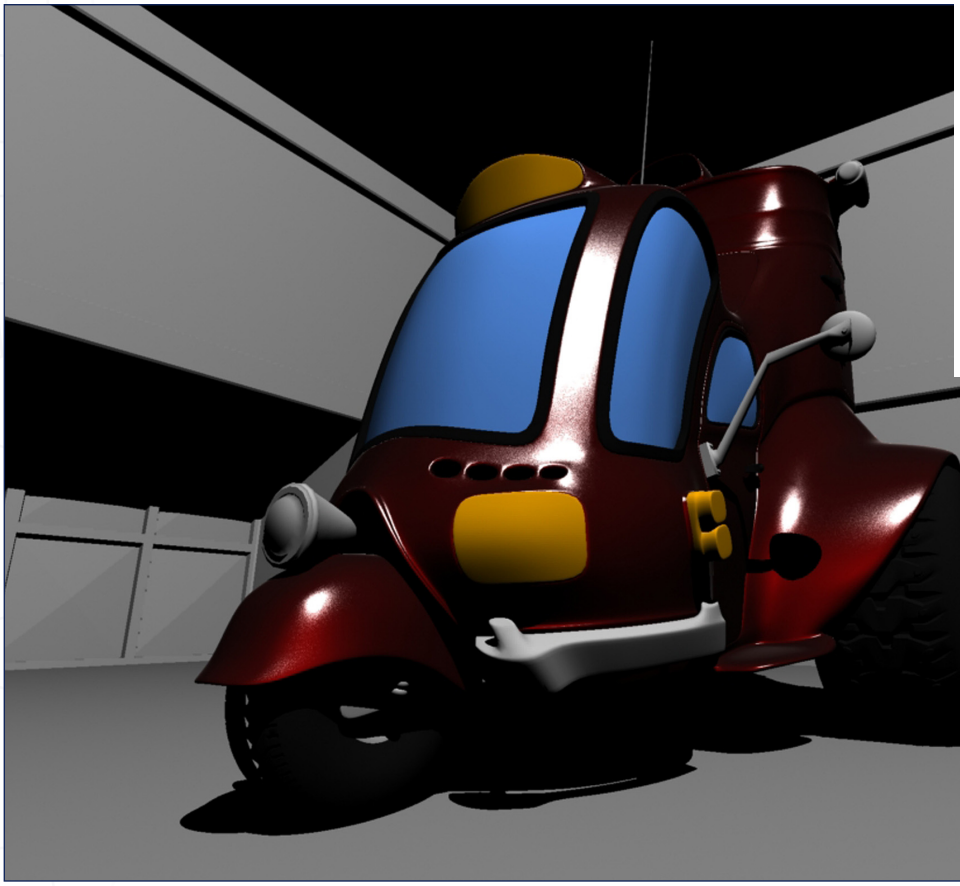
28. Make another Render and you should have something similar to Fig.28. Don't worry if the picture is still too dark, we will deal with lighting in the next parts of this tutorial. Here are some renders of the scene from different viewpoints:

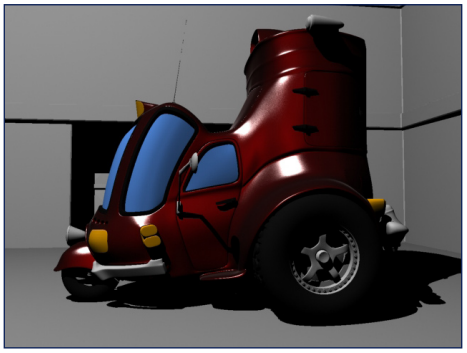
















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Chapter 2:
Assigning Materials & Shaders - Part 2

Assigning Materials & Shaders - Part 2

In this chapter we'll complete the work on the materials and shaders we have set in the first part of the tutorial. Some minor changes and fine-tunings will be done later on in the other parts, but for now we will define the main aspects of every material of the vehicle. We'll need some additional mental ray free shaders. You can download them from the net, at the following URL:
http://newsletters.hagerman.com/newsletters/Images/Ebul%2042/max%20article/max_mrt.zip

After downloading the file, extract it somewhere on your hard drive and then copy the mrt.dll file into \Autodesk\3dsMax8\mentalray\shaders_autoload and the other two .mi files into \Autodesk\3dsMax8\mentalray\shaders_autoload\include.

01. Let's start from the Glass material. Click on the "Standard" button and choose Mental Ray as the type of material. Click on the Surface slot and choose Glass (Lume), as shown in Fig.01. Also put a Photon Basic (base) shader into the Photon slot.

02. Click on the Glass (Lume) slot to open its parameters. Set the Diffuse and the Surface Material to the same blue-ish colour. Go to the Blur Reflection tab, check the On option and set the Spread value to 2,0 and the Samples to 6. Click on the small squared slot next to Transparency and select a Falloff map from the browser.

03. Open the Falloff map parameters and modify the falloff curve as shown in Fig.03. You may have to add a couple of new points on the curve to achieve the effect.

Fig 01

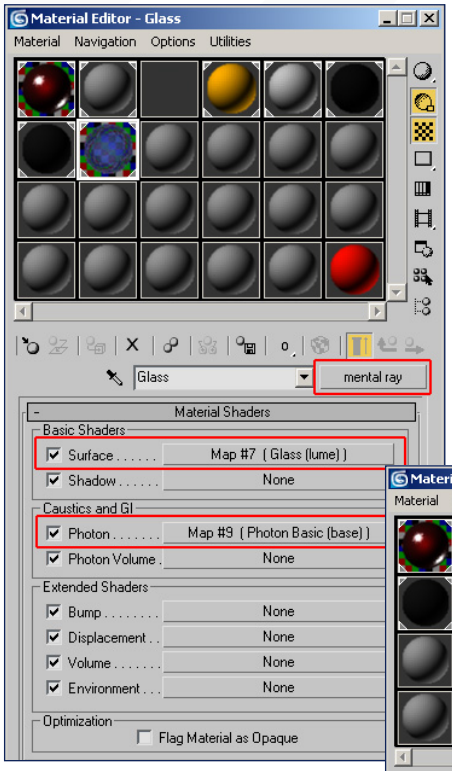


Fig 02

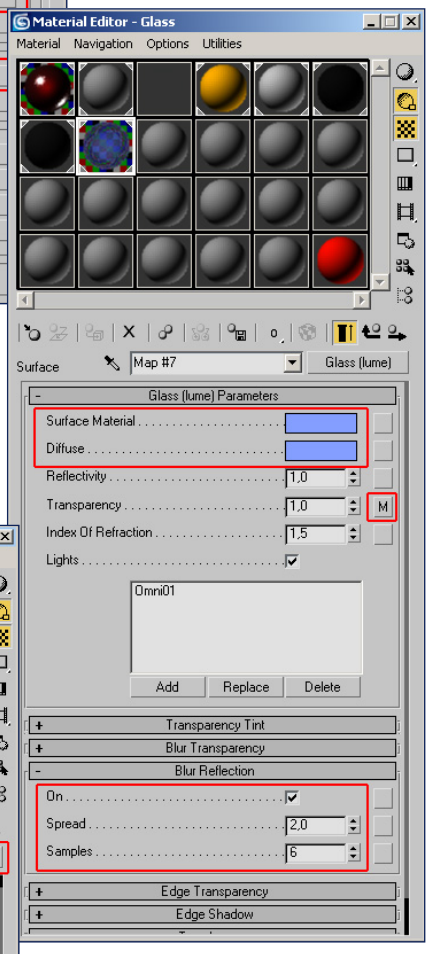
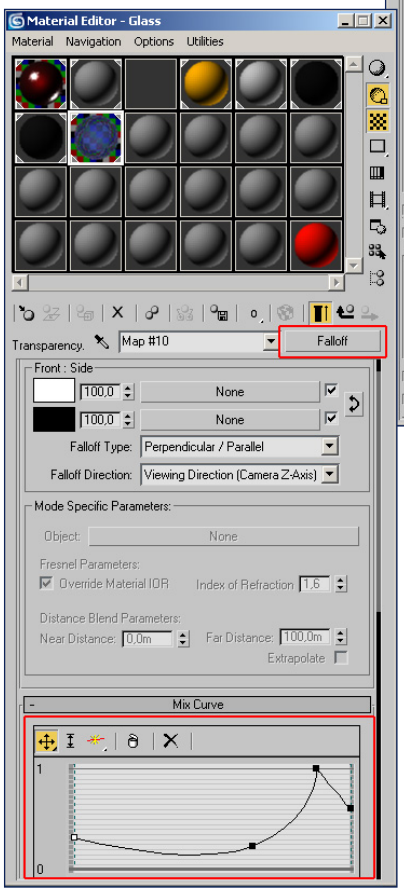


Fig 03



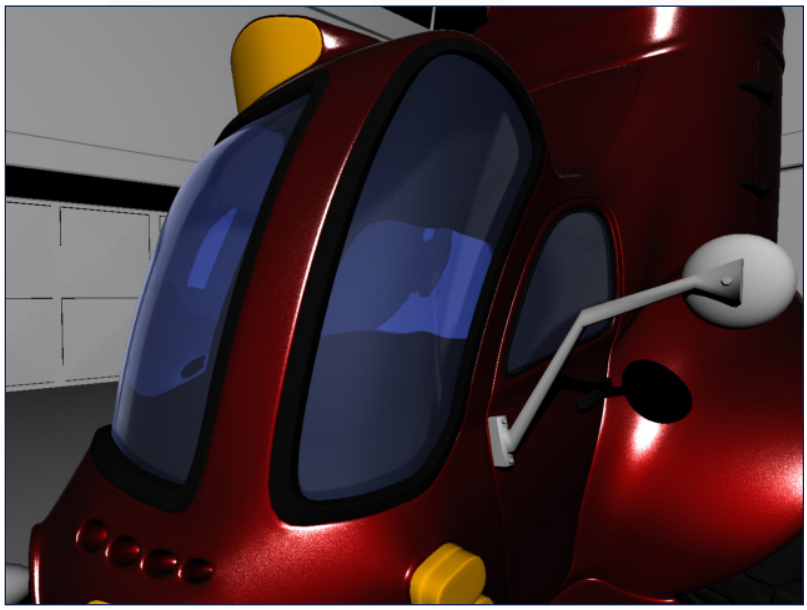


Fig 04

04. Render the scene and see how the glass looks. If you don't like the blue-ish colour, you can simply change the Diffuse and Surface Material colours in the Glass (Lume) tab.

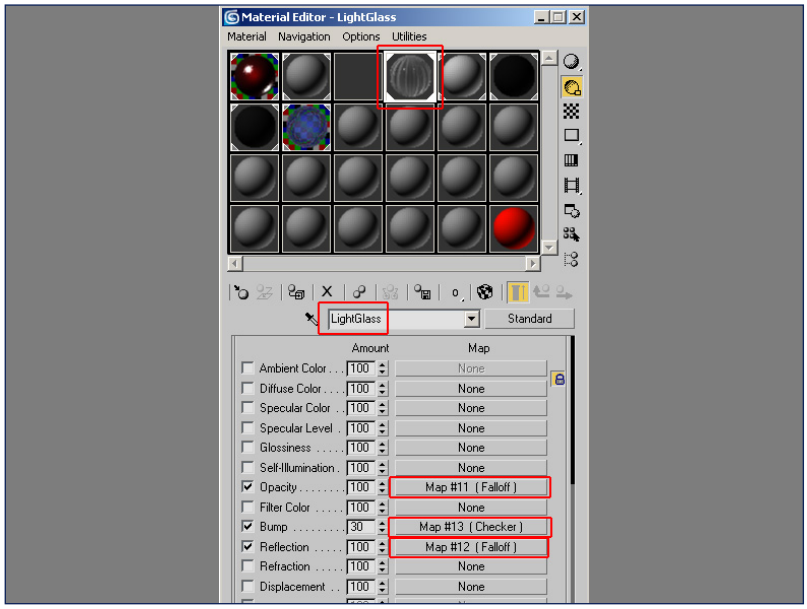


Fig 05

05. Now let's take care of the lights' glass. Leave the material as Standard. Put a Falloff map into the Opacity slot, a Checker map into the Bump slot and another Falloff map into the Reflection, as shown in Fig.05. Now we'll see how to change their parameters.

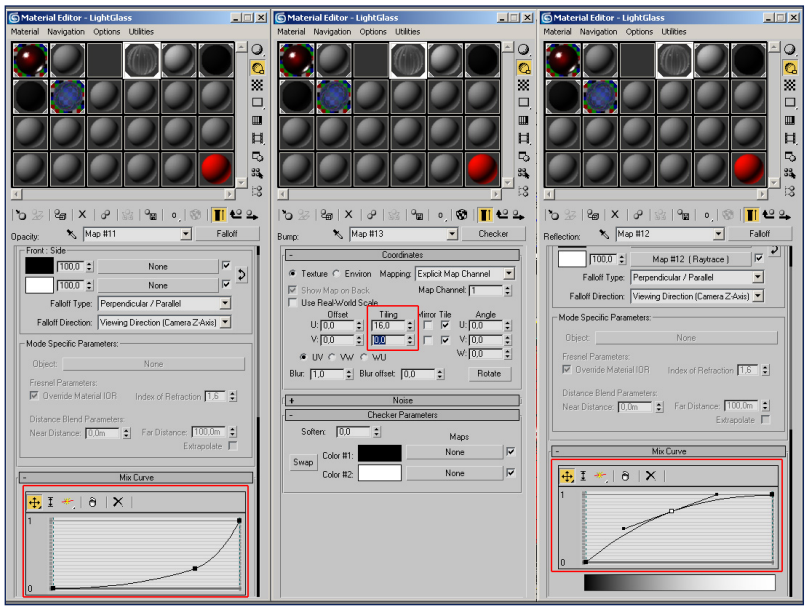
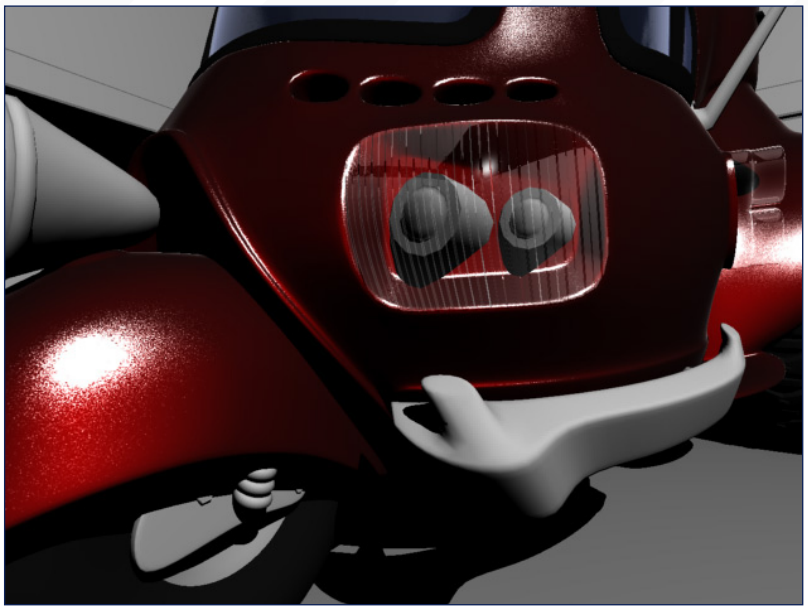


Fig 06

06. In Fig.06 you can see the parameters for each map you just put into the material's slots. Change the first Falloff curve for the Opacity, as shown on the left part of Fig.06. Go to the Checker map options and change its tiling to 16,0 / 0,0 (centre part of Fig.06). Finally, change the curve for the Falloff map to Reflection (right part of Fig.06).

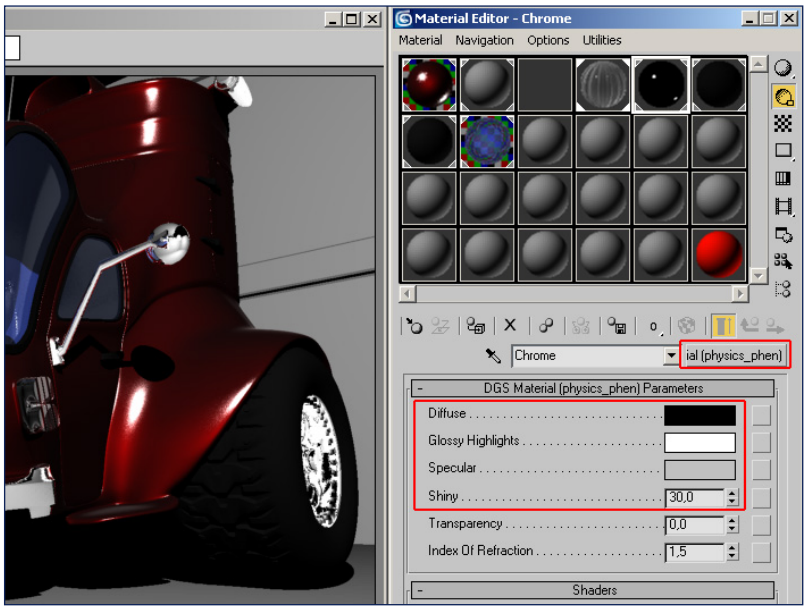
07. Render the scene again. You should have something similar to Fig.07. If there is too much specularity on the glass, just change the values of the Specular and Glossiness of the Light Glass material.

Fig 07



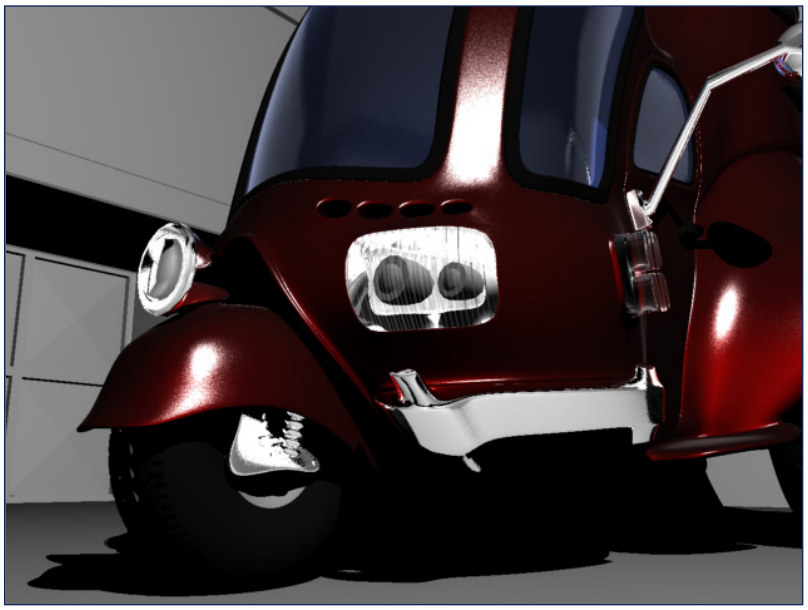
08. Select the Chrome material. Change its material type to DGS (physics_phen) and modify its parameters, as shown in Fig.08. See the Diffuse to pure black; Glossy Highlights to pure white and Specular to a bright grey. Also, change the value of Shiny to something like 30. Render the scene and have a look at how the chrome parts behave.

Fig 08



09. Let's go back to the front lights' area. Select the inner part of the front light, detach it from the main vehicle body, and assign the Chrome material to it. Render the scene again. The Chrome material gives some nice reflections into the front light area. Repeat the process for the other front light, too.

Fig 09



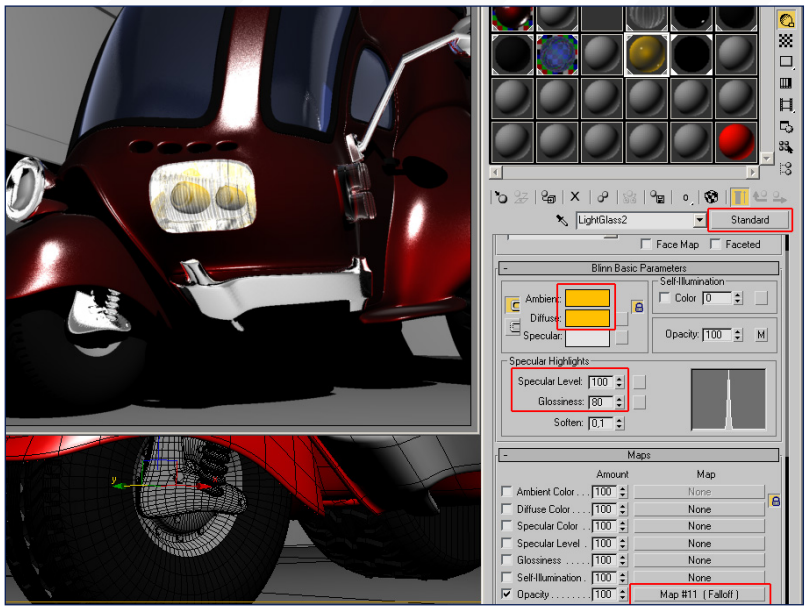


Fig 10

10. Select the lights' material, change the colour to a bright orange (or any other colour you like), and change the Specular Level to 100, and Glossiness to 80. Also, add another Falloff map to the Opacity slot (Fig.10).

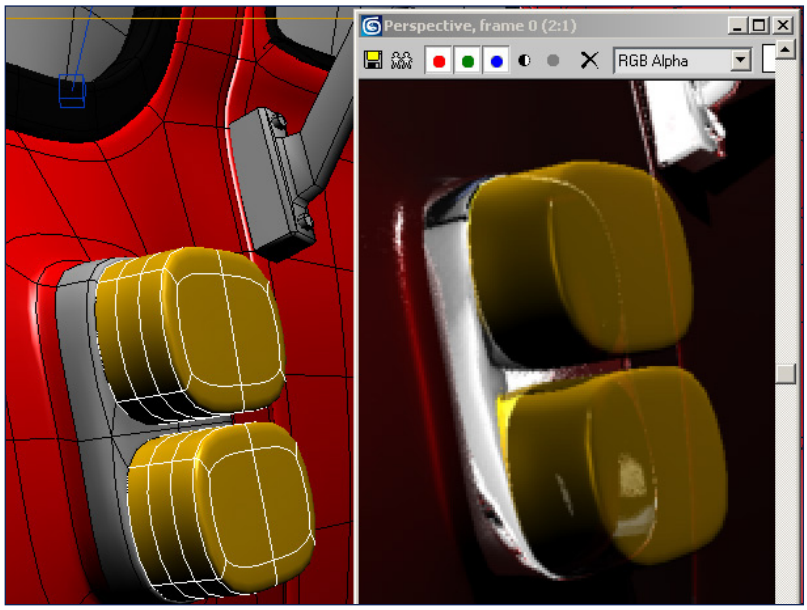


Fig 11

11. Select the side light. Detach the part of the mesh marked with the white wireframe in Fig.11, and assign the light material to it. Assign the Chrome material to the rest of the mesh, and do a test render. Repeat the process for the other side light, too.

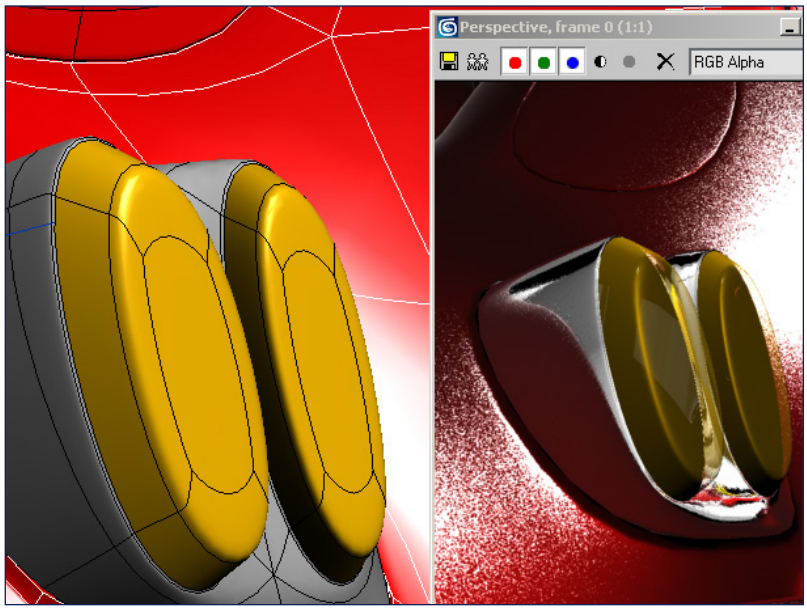
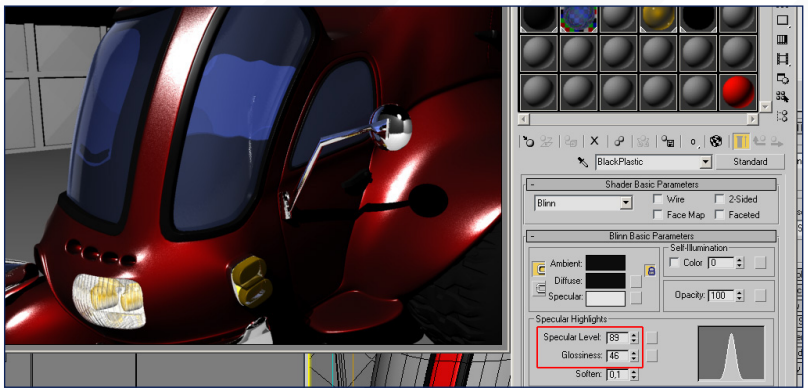


Fig 12

12. Do the same thing for the back lights. Assign the orange material to the detached part of the mesh, and the Chrome material to the rest. Once again, do a test render to see what happens (Fig.12).

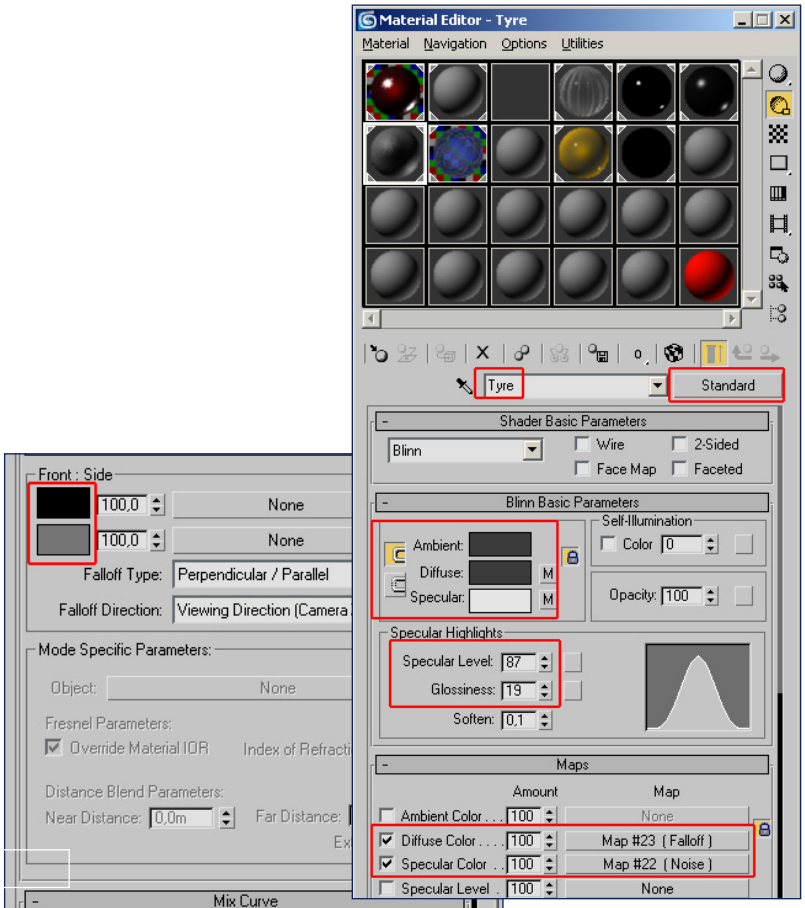
13. The black plastic material is quite simple. Just set its colour to pure black, and change its Specular Level to 89, and its Glossiness to 46. See how it behaves in the rendering (Fig.13).

Fig 13



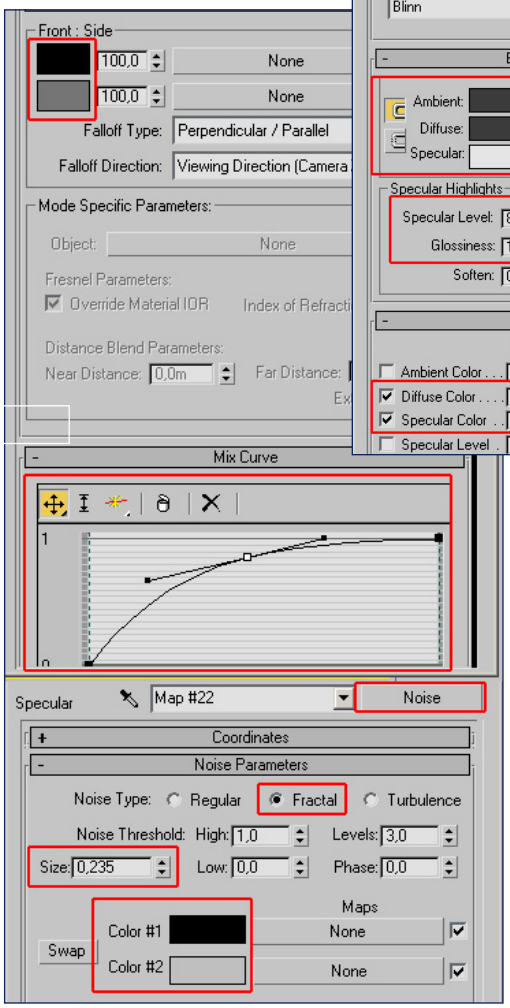
14. Now let's take care of the tyre shader. Leave it as Standard material. Set its Ambient and Diffuse colour to a dark grey. Change its Specular Level to 87 and its Glossiness to 19. Assign a Falloff map to the Diffuse Colour slot and a Noise map to the Specular Colour (Fig.14).

Fig 14

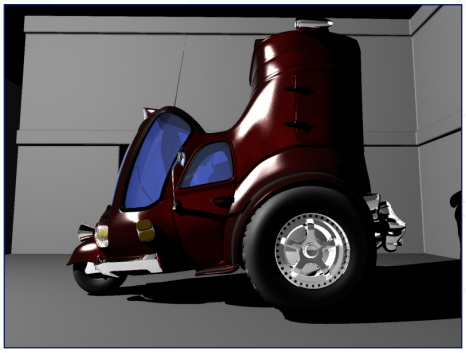
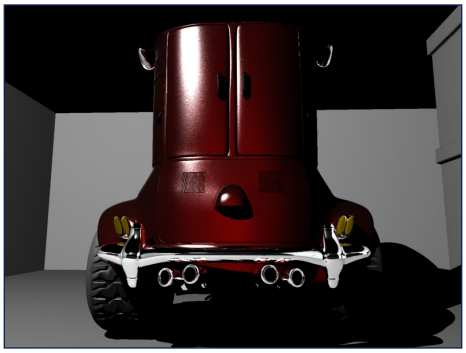
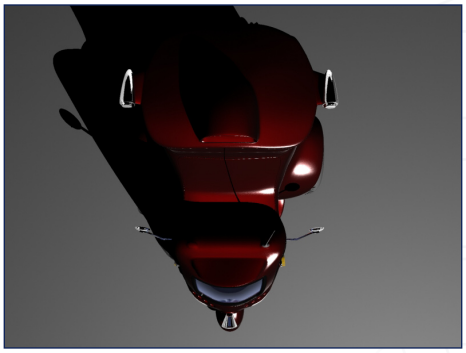


15. Modify the Falloff map, as shown in top part of Fig.15 (set the two colours to pure black and dark grey, and modify the falloff curve to get something similar to Fig.15). Go to the Noise map parameters and set the type to Fractal. Change the Size to 0,235 (please note that it depends on your scan size and units, so you may have to try different sizes for the noise). Also, change the Noise colours to pure black and bright grey (bottom part of Fig.15).

Fig 15



16. Here are some renders from different views of the model. Now you can use your own photographic textures on the environment. In this tutorial we'll concentrate only on the vehicle materials and shaders, so you are free to use every texture you want for the environment.





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Chapter 3:
Lighting Setup & Rig (with HDRI) - Part 1

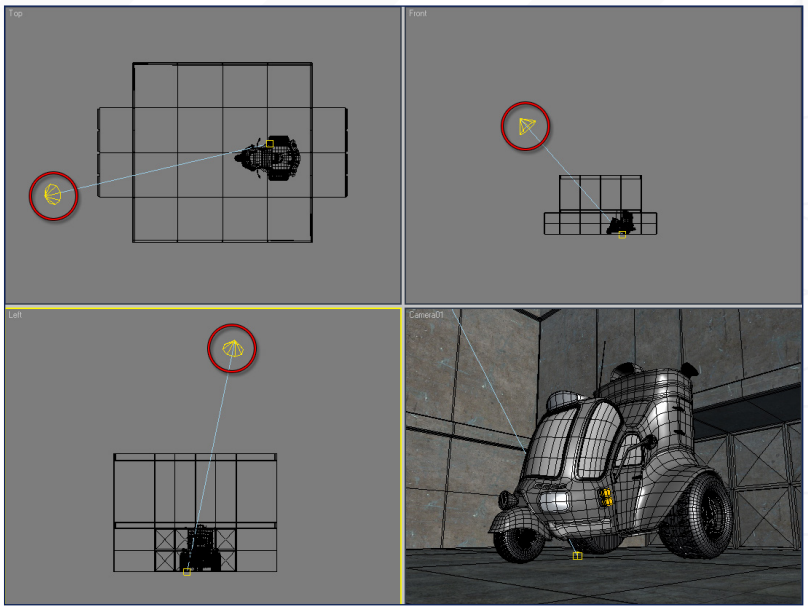
3ds max

Lighting Setup & Rig (with HDRi) - Part 1

Just a quick note before we start working on the lighting: in the new 3DS Max 9 version there are a lot of new Mental Ray shaders, and there is also a very nice and powerful Car Paint shader. I suggest you use that one if you are working with version 9 of 3DS Max!

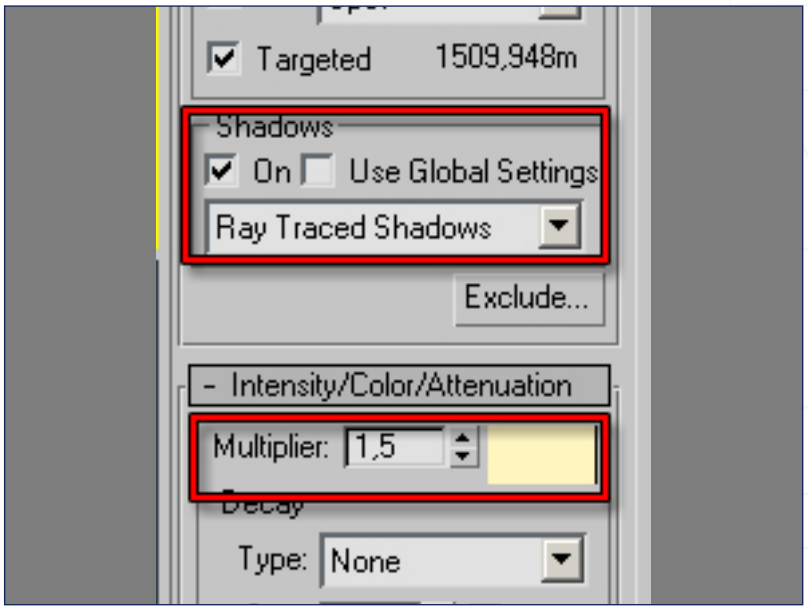
1. Let's begin by creating a Spotlight: position it as shown in Fig.01.

Fig 01



2. Check the ON option for the Shadows (set them as Ray Traced Shadows), then change the colour of the light to a bright yellow, and set its Multiplier to 1,5 (Fig.02).

Fig 02



3. Hit F9 to quickly render the scene. You should get something similar to Fig.03

Fig 03



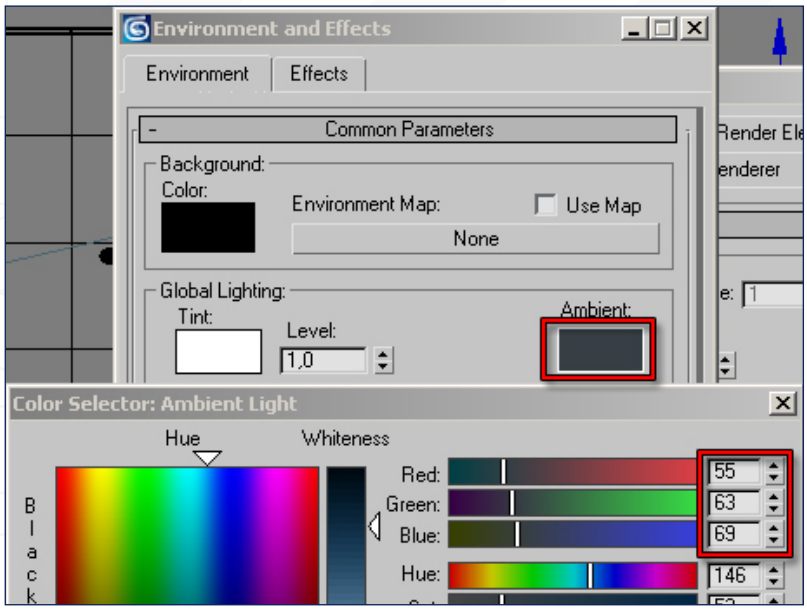


Fig 04

4. Go to the Rendering / Environment window and set the Ambient colour to a dark blue (Fig.04).

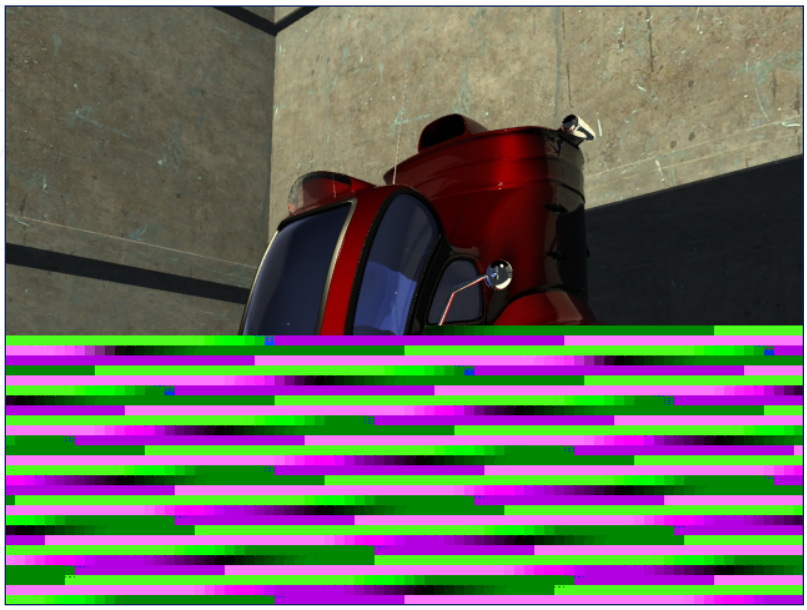


Fig 05

5. Render the scene again (Fig.05). Now there is a pale shade of blue, instead of the pure black.

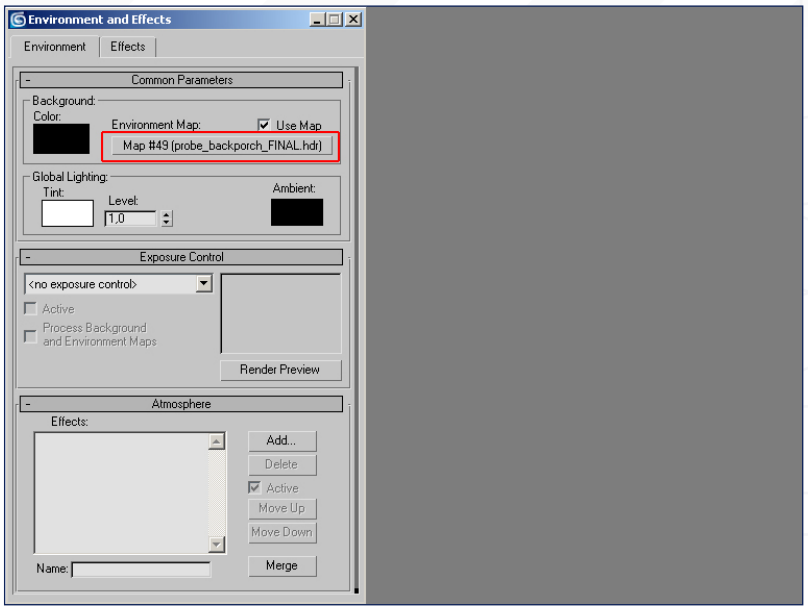


Fig 06

6. Create a giant sphere that surrounds the whole scene, then convert it to Editable Mesh and select / delete half of it (Fig.06).

7. Also plug the HDRI map into the "Environment Map" slot of the Environment and Effects settings (Rendering/Environment menu) (Fig.07). This will allow the HDRI map to show in the reflections of reflective objects in the scene.

Fig 07



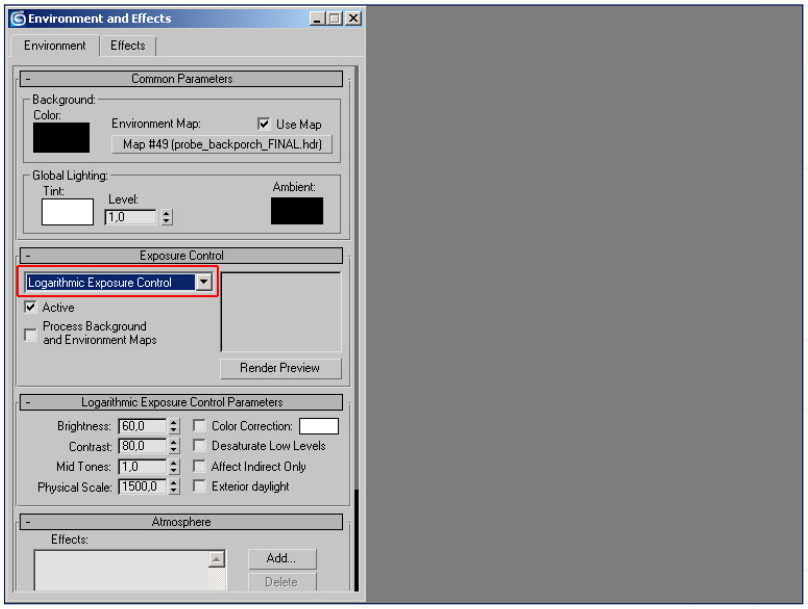
8. Now render the scene again (Fig.08). The HDRI is lighting the scene, together with Final Gathering, and it also appears in the reflections. But the image is still too dark, and there are also over-exposed parts in the render.

Fig 08



9. Go back to the Environment and Effects panel, and in the "Exposure Control" tab select "Logarithmic Exposure Control" from the drop-down menu (Fig.09). Leave everything else as it is for the moment.

Fig 09



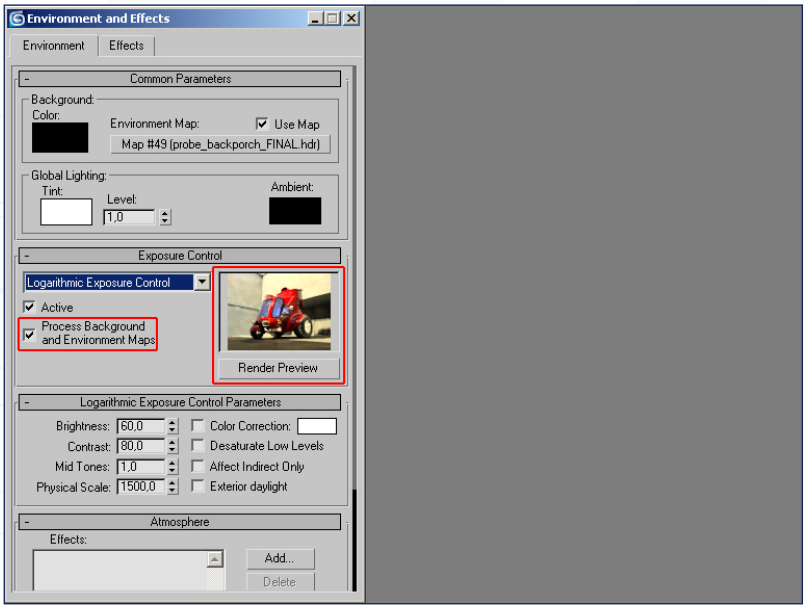


Fig 10

10. Enable the “Process Background and Environment Maps” option, and click on the “Render Preview” button (Fig.10). After a few seconds, the rendered image should appear in the opposite preview box. Now we can alter the Exposure Control parameters, giving us real-time feedback on the preview image.

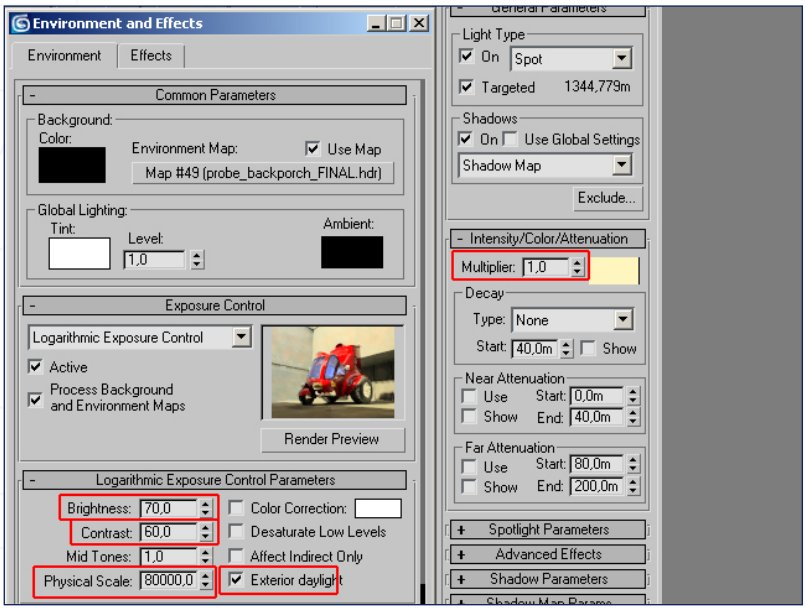


Fig 11

11. Set the “Brightness” to 70, and the “Contrast” to 60. Enable the “Exterior Daylight” option and set the “Physical Scale” value to 80000 (Fig.11). Also lower the “Mutliplier” of the Spotlight a little to avoid the problem with over-exposure.

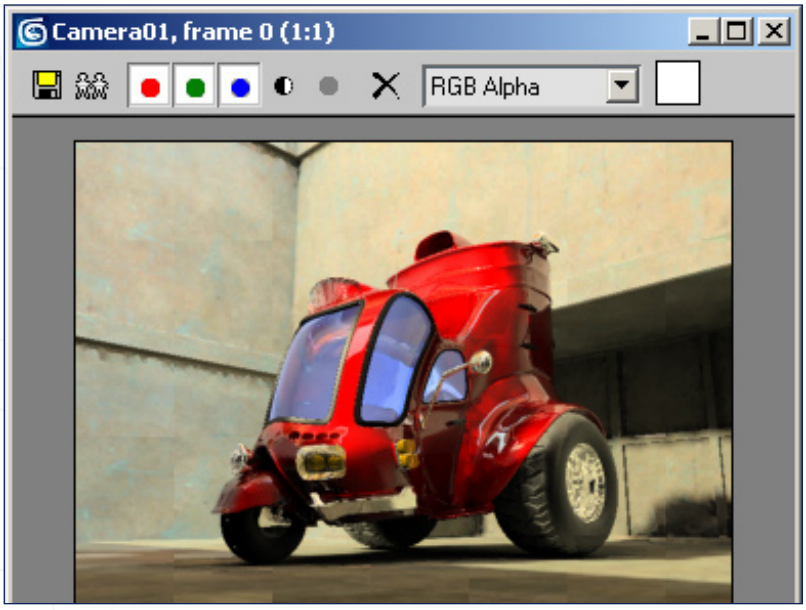
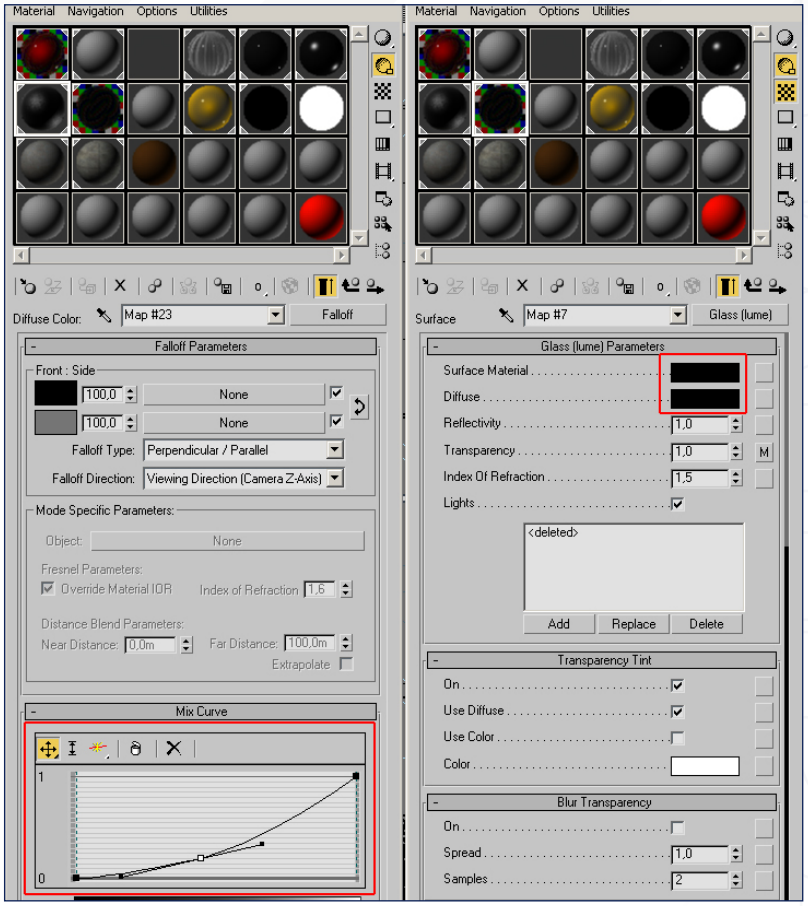


Fig 12

12. Render the scene again. Now, the rendering is much brighter (Fig.12).

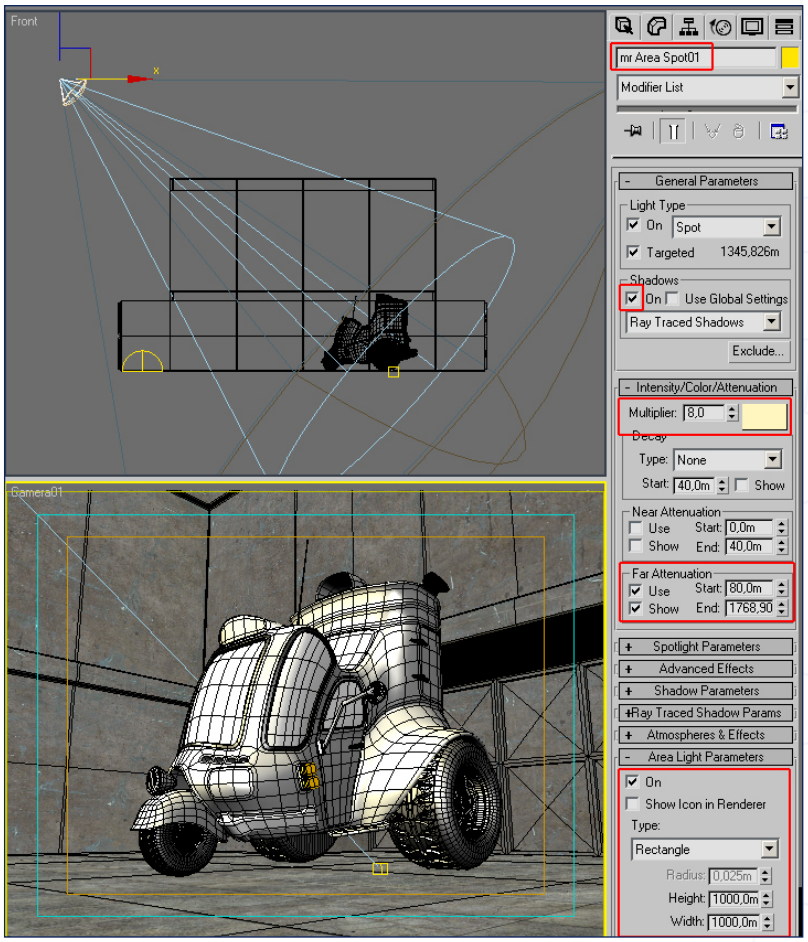
13. This step is optional. I have simply modified the Tyre shader and the Glass shader, as they looked too “toonish” to me. I also modified the Falloff curve in the Diffuse slot of the Tyre shader, and set the Glass color to black. You can also do these things, or perhaps you can leave them as they are - it’s up to you, and it depends upon the look that you want to give your render.

Fig 13



14. One more thing to take care of is the shadows. Delete the Spotlight and create a new mental ray Area Spot light. Position it in the same way as we did with the old Spotlight, and make sure that it casts shadows (Fig.14). Pump up the Multiplier value to 8 and enable the “Use” and “Show” options for Far Attenuation. Set “Start” to 80, and “End” at about 1700/1800. Go down to the Area Light Parameters rollout and increase the “Height” and “Width” values. If you want more precise, and nice, shadows at the cost of a higher render time, you can of course increase the samples.

Fig 14



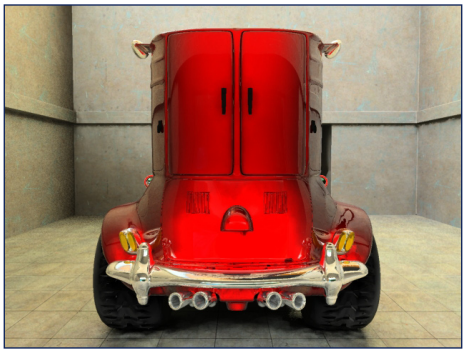
Here are some renders from different points of view. Next month, we'll take care of different rendering aspects, and we'll also look at how to use some advanced effects, like depth of field, anti-aliasing, and so on.

The HDR Image used for this tutorial has been kindly been supplied by www.unparent.com. The HDR Image can be downloaded free here:

HDRI













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3ds max

Chapter 5:
Render Techniques - Part 1

Render Techniques Part 1

In this part of the tutorial we'll see some common render techniques in action, and we'll have a look at Ambient Occlusion and DOF (depth of field). The final part (next month) will be dedicated to render optimization (AntiAliasing techniques, image composition and retouching in Photoshop).

Let's start with the Ambient Occlusion (AO), which is a fairly recent technique to achieve more realism in render. Not so long ago you had to do some tricky stuff to obtain an AO pass to composite with the final rendered image, but finally every software package has included tools for generating AO passes directly and easily. Let's see how 3DS Max and Mental Ray handle this...

1. Open the "TucTuc_HDRI_Done.max" scene (it was included with last month's part of the tutorial) and render it. Save the result in any picture format you like (Fig 01).

2. Open the Material Editor (<M>) and create a new material called "AO_Shader". Click on the "Standard" button and choose "mental ray" from the browser (Fig 02).

3. Click on the Shader slot and choose Ambient/ Reflective Occlusion from the browser. Leave all the parameters as they are for now (Fig 03).

Fig 01



Fig 02

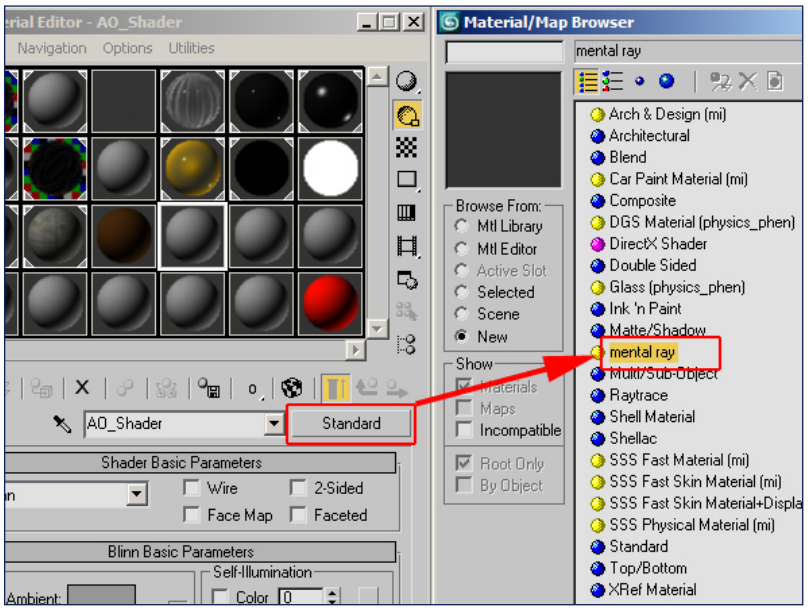
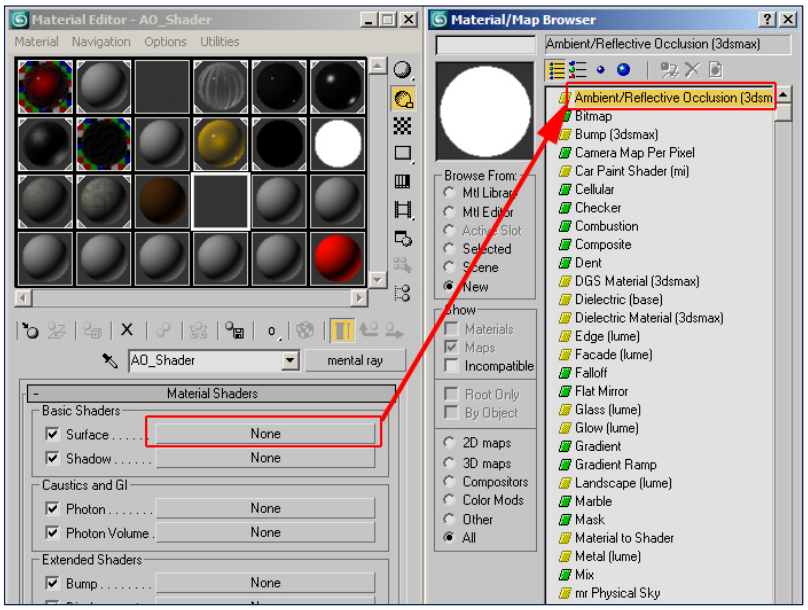


Fig 03



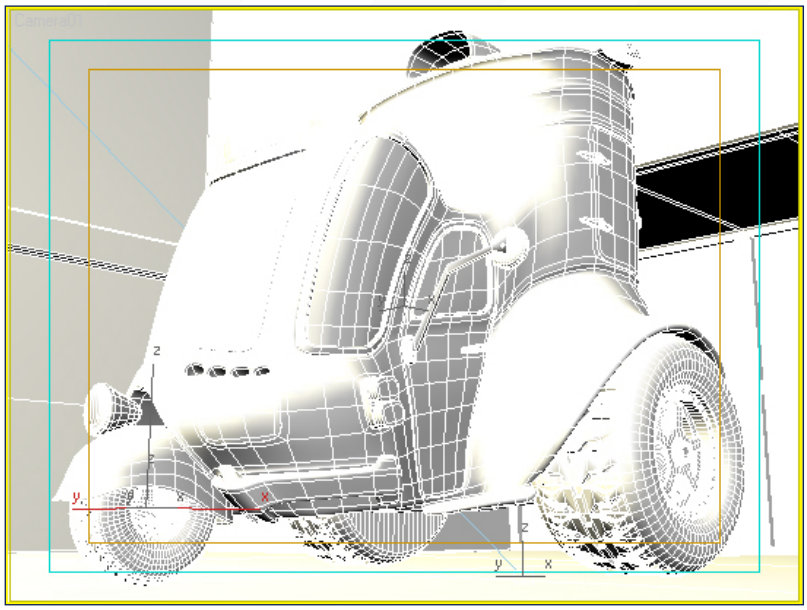


Fig 04

4. Select all the objects in the scene (<Ctrl> + <A>) and assign the AO_Shader to them (Fig 04).

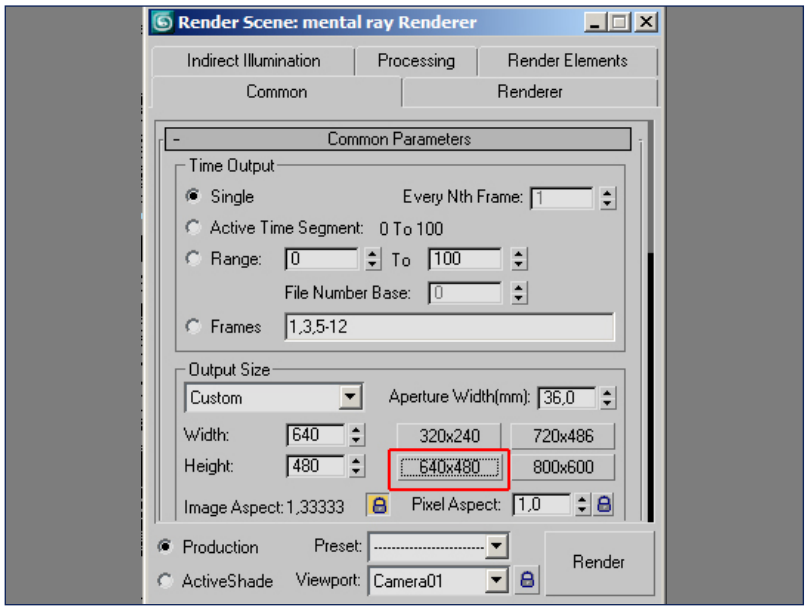


Fig 05

5. Open the Render panel (<F10>) and click on the 640x480 size preset (Fig 05).

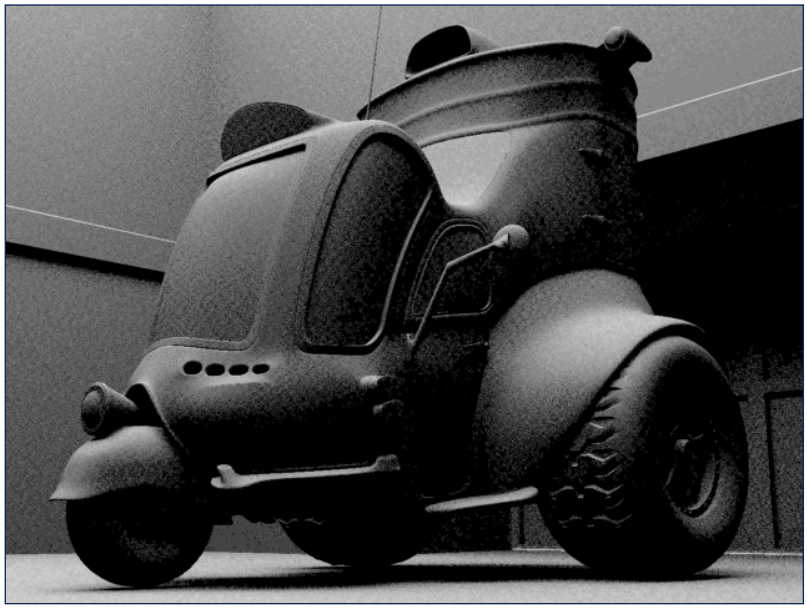
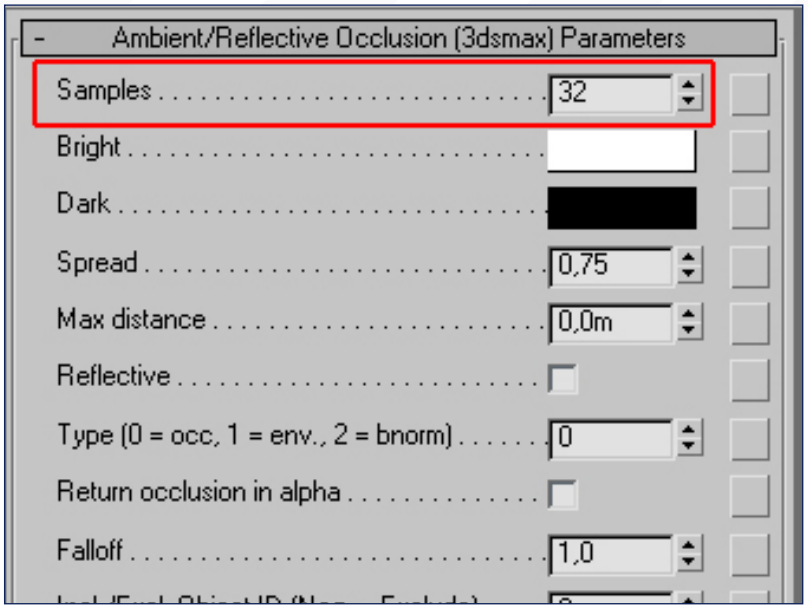


Fig 06

6. Now render the scene (<F9> for quick render) and see what happens. We will notice that mental ray rendered the Ambient Occlusion pass, but the quality of the solution is not so good, so we need to increase it (Fig 06).

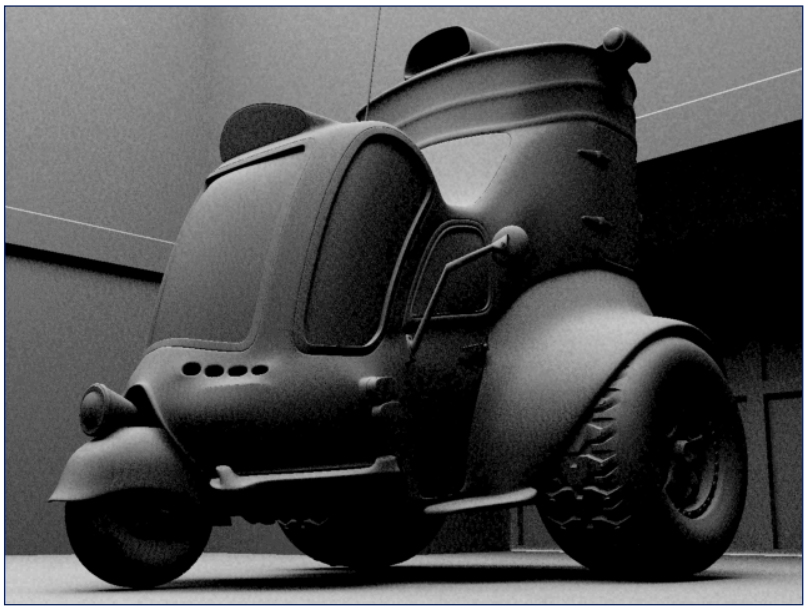
7. Go back to the Material Editor, click on the Ambient Occlusion slot and enter a higher value of Samples (Fig 07).

Fig 07



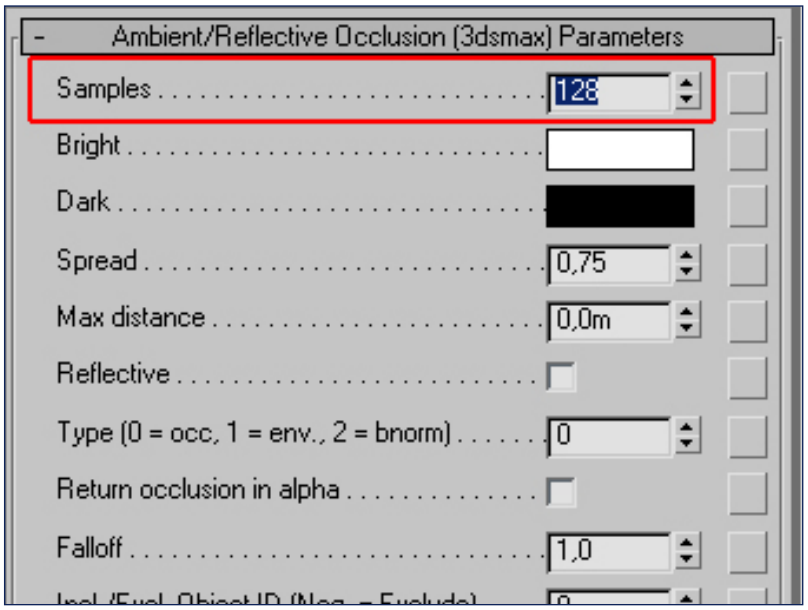
8. Render the scene. Now it looks better, but it still is not enough (Fig 08).

Fig 08



9. Enter a high value of Samples, for example 128 (Fig 09).

Fig 09



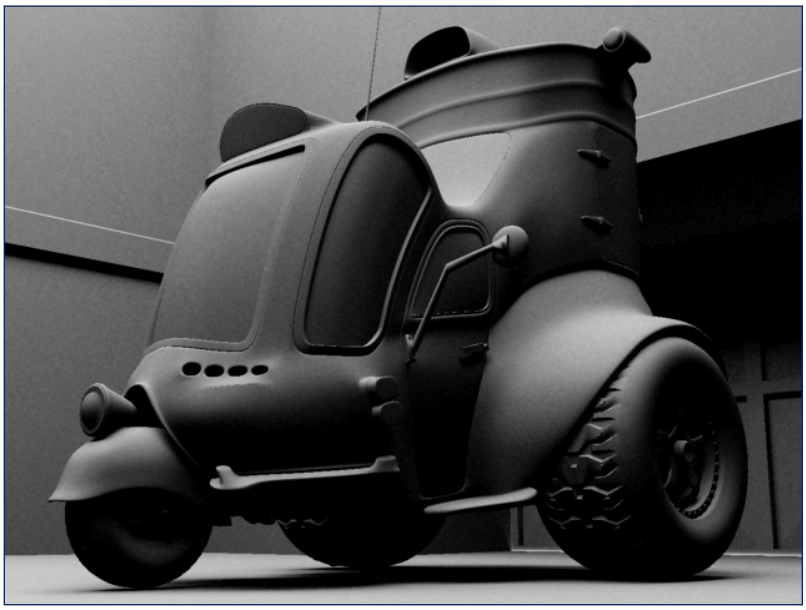


Fig 10

10. Render the scene again. Now we have a decent quality for the AO solution, and we can composite this pass over the original render in Photoshop or other similar 2D applications (Fig 10).

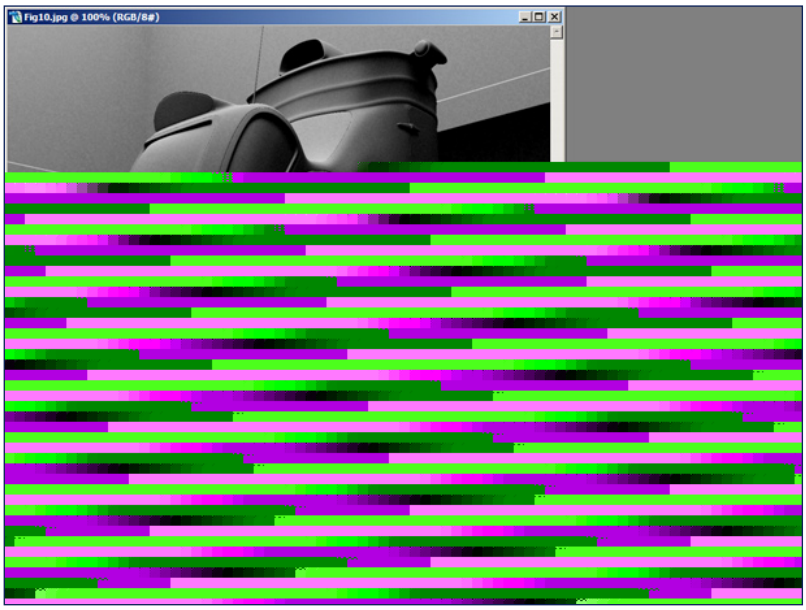


Fig 11

11. Open Photoshop and import both the original render and the AO pass (Fig 11).



Fig 12

12. Switch to the AO pass image and Select All (<Ctrl> + <A>) and Copy (<Ctrl> + <C>). Now switch to the original render image and Paste (<Ctrl> + <V>). Rename this new layer “AO_Pass” (Fig 12).

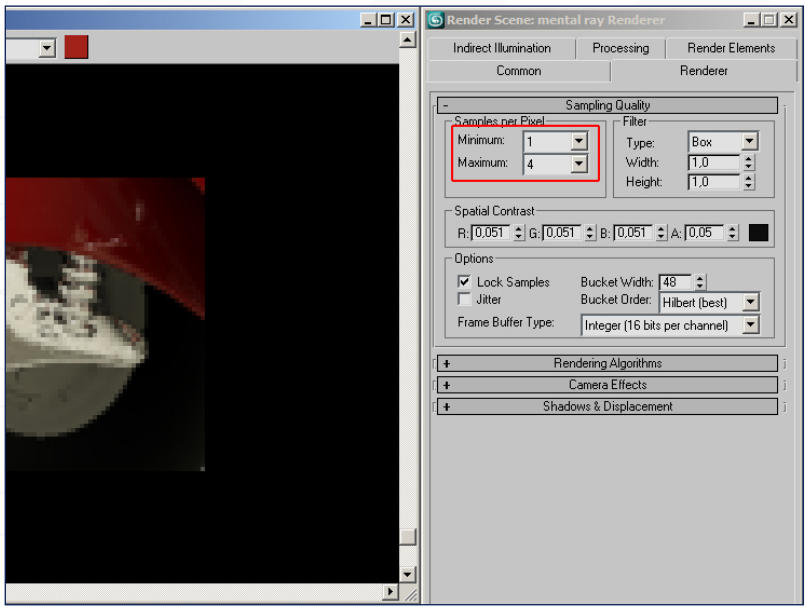


Fig 04

4. Set the Minimum value to 1 and the Maximum value to 4, and then render again (Fig04). There is still no significant difference for render times using these values.

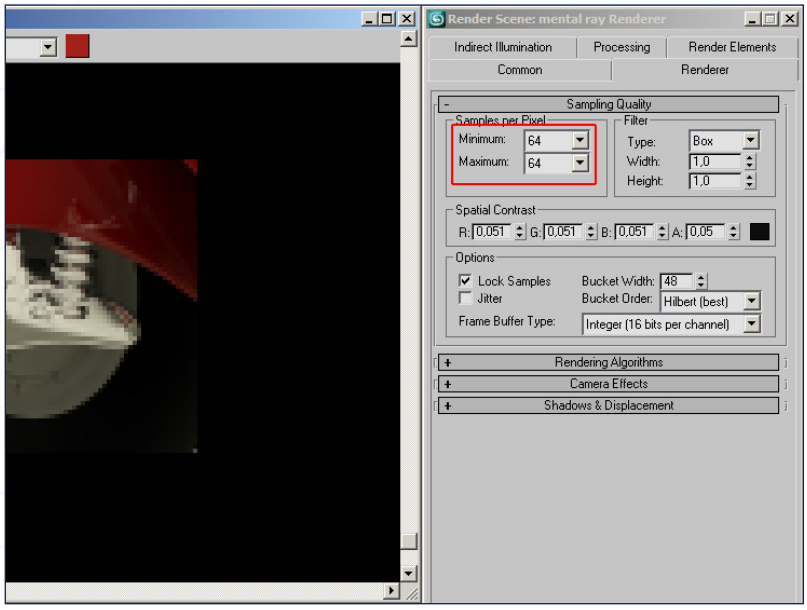


Fig 05

5. Now set both Minimum and Maximum values to 64 and prepare for a much longer render time (Fig05). It takes longer to render, but the quality of the image is noticeably better.

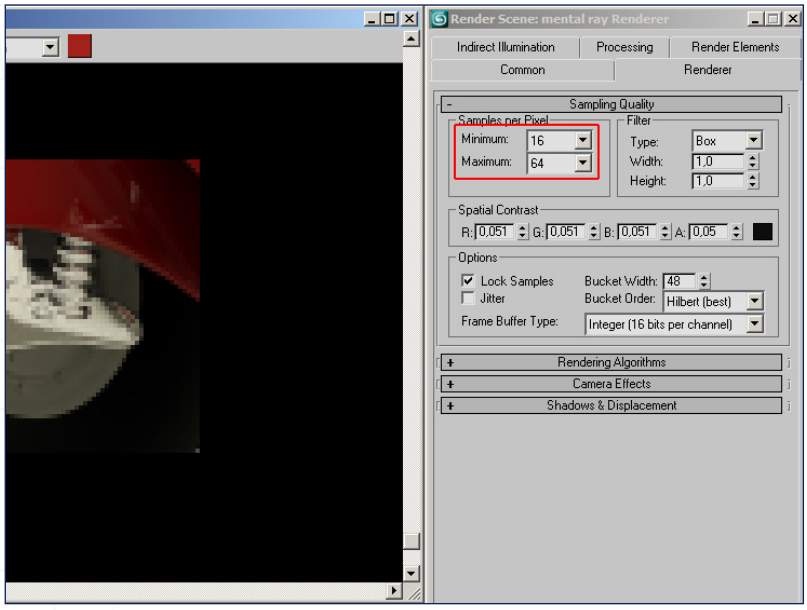
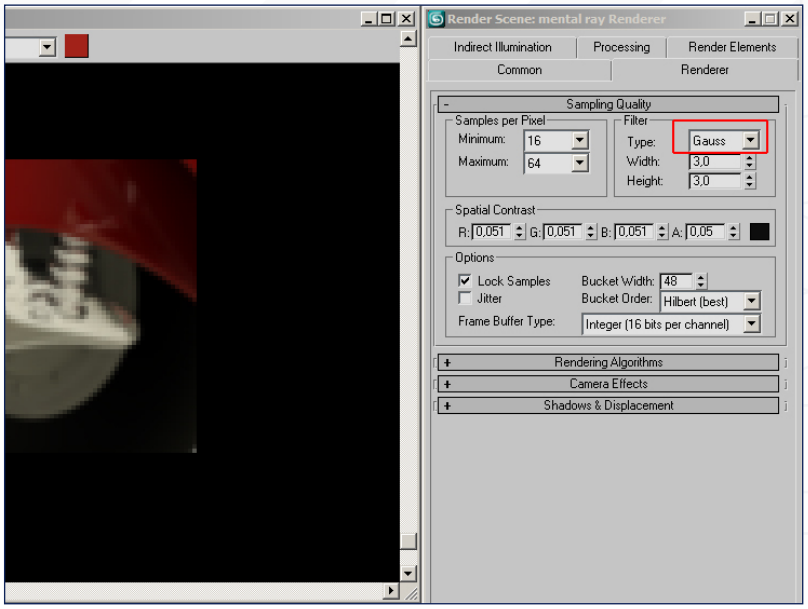


Fig 06

6. Bring the Minimum value down to 16 and render again. It takes an acceptable amount of time and the quality is not too different from the previous settings, so we can therefore use this configuration which represents a good quality and a compromise in time.

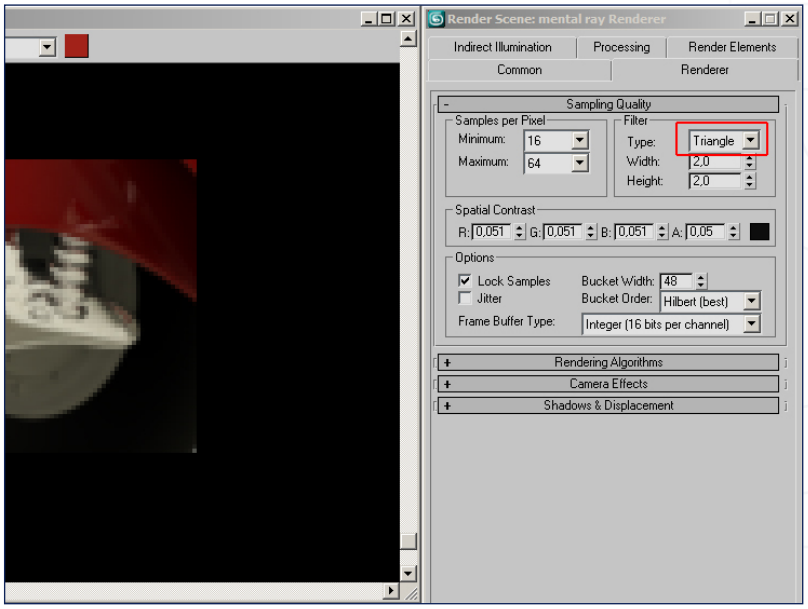
7. Now let's play with the Filtering types a little. Change the Filtering to Gauss and then render again (Fig07).

Fig 07



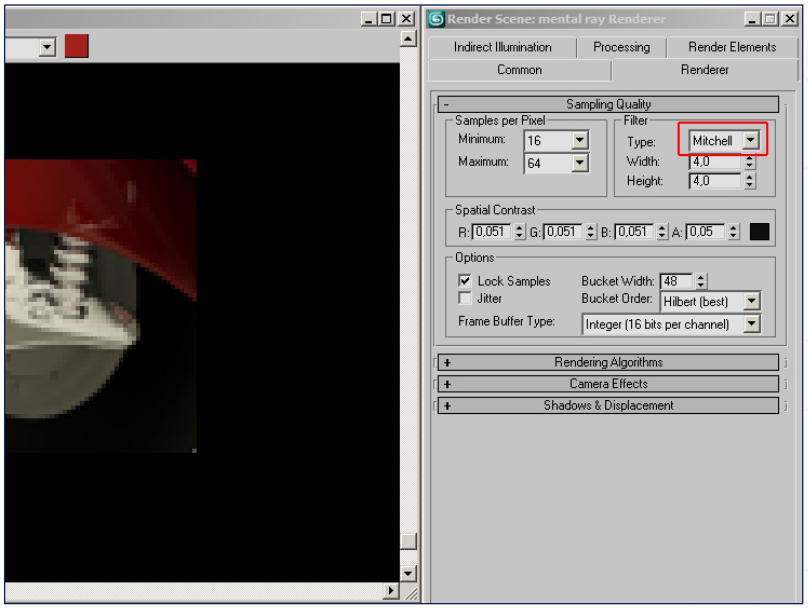
8. Change the Filtering type to Triangle. Render again (Fig08).

Fig 08



9. Now try the Mitchel Filtering and render again (Fig09).

Fig 09



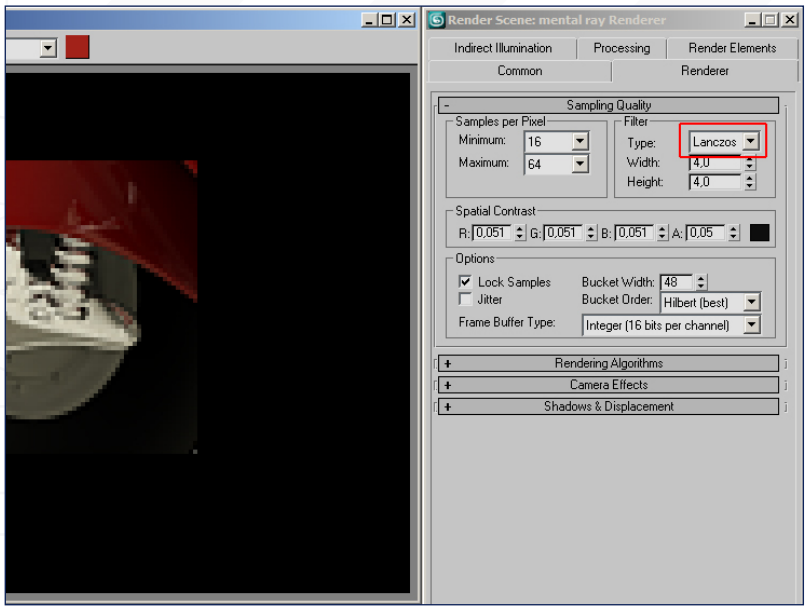


Fig 10

10. Finally, use the Lanczos Filtering and render the scene (Fig10).

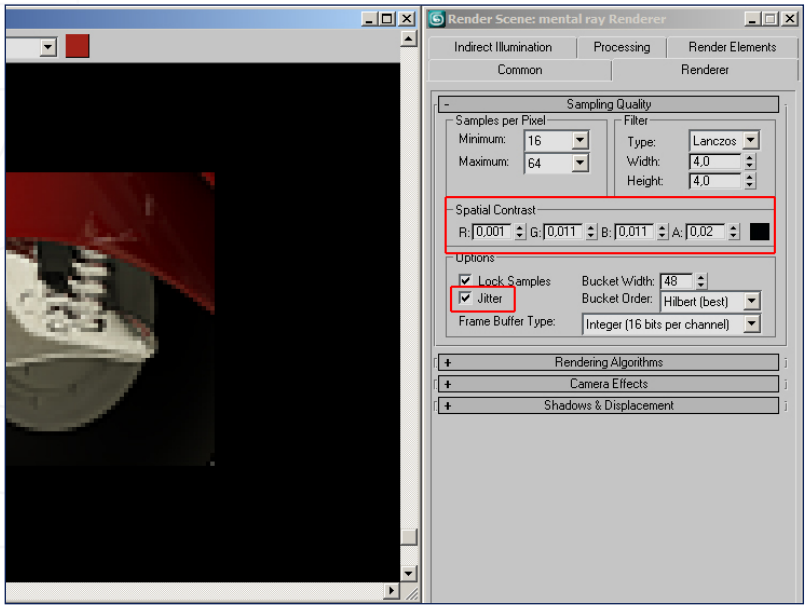


Fig 11

11. Set the Spatial Contrast to a very low value, and enable the Jitter option. Render again (Fig11). Now we have a very sharp, good quality image with a not-too-long render time.



Fig 12

12. We can now render the whole scene with the new settings (Fig12).

13. Now let's re-organise our scene to prepare it for compositing and post-production work in Photoshop. First of all, let's hide the lights and the camera. We can do this in different ways, but the fastest way is to go into the Display tab and check the Lights and Cameras options to hide them (Fig12).

14. Select all the vehicle components and create a new Selection Set by entering a name into the text box shown in Fig14. This will allow us to rapidly select the vehicle whenever we need it.

15. Open the Object Properties panel (Edit > Properties) and un-check the Visible to Camera option. This will allow us to render the environment only, maintaining all of the shadows and the GI and FG calculations (Fig15).

Fig 13

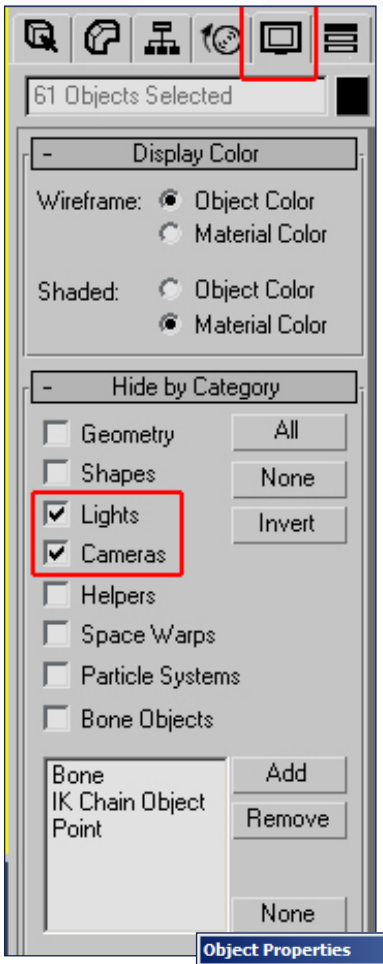


Fig 15

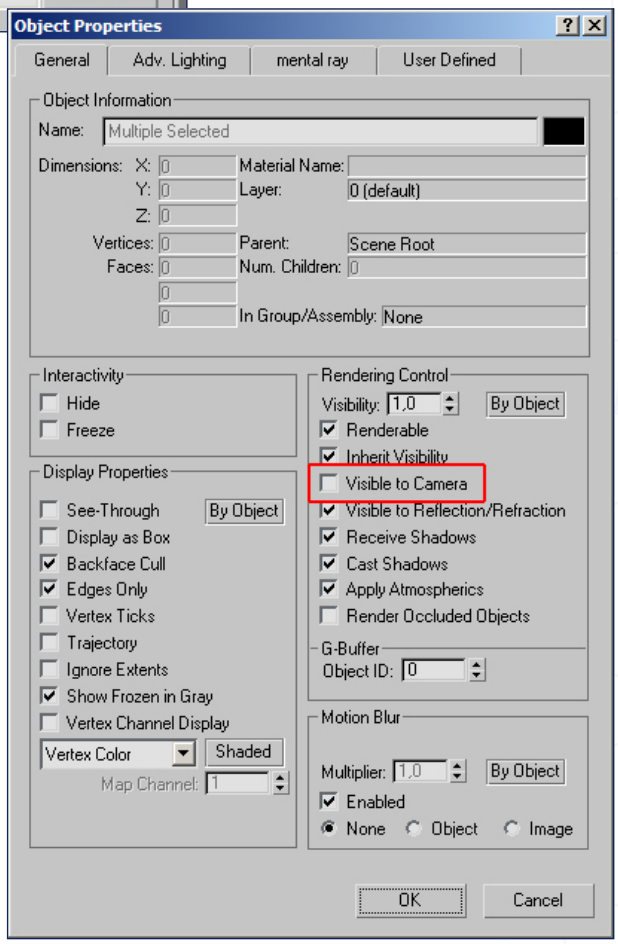


Fig 14

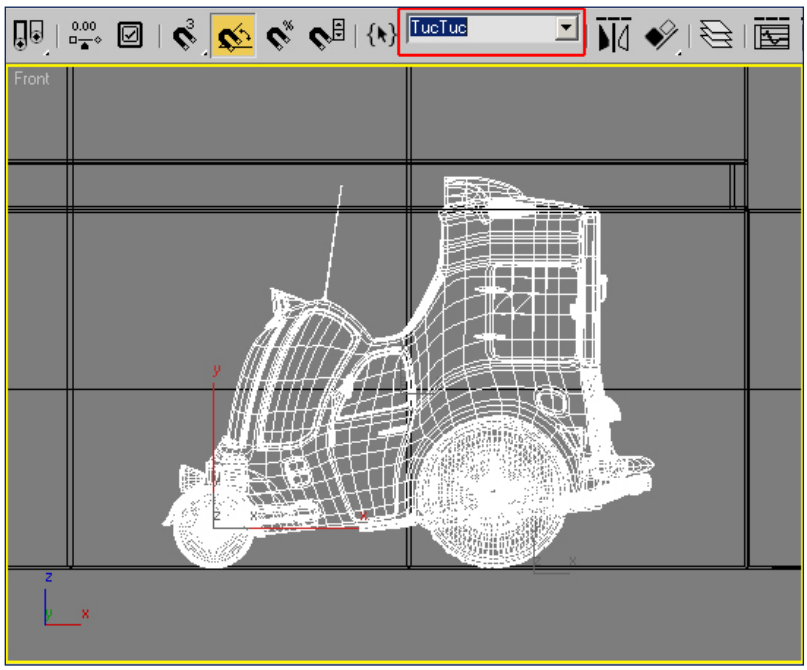




Fig 16

16. Render the scene and save the picture in any format you like (Fig16).

17. Select the vehicle again (using the Selection Set we just created) and enable the Visible to Camera option. Now select all the Environment meshes and disable its Visible to Camera option in the Object Properties panel (Fig17).

18. Render the scene again, and you'll only get the vehicle with all of its reflections, shadows and GI/FG solutions (Fig18). Save the picture in TGA 32 Bit format to maintain the alpha channel.

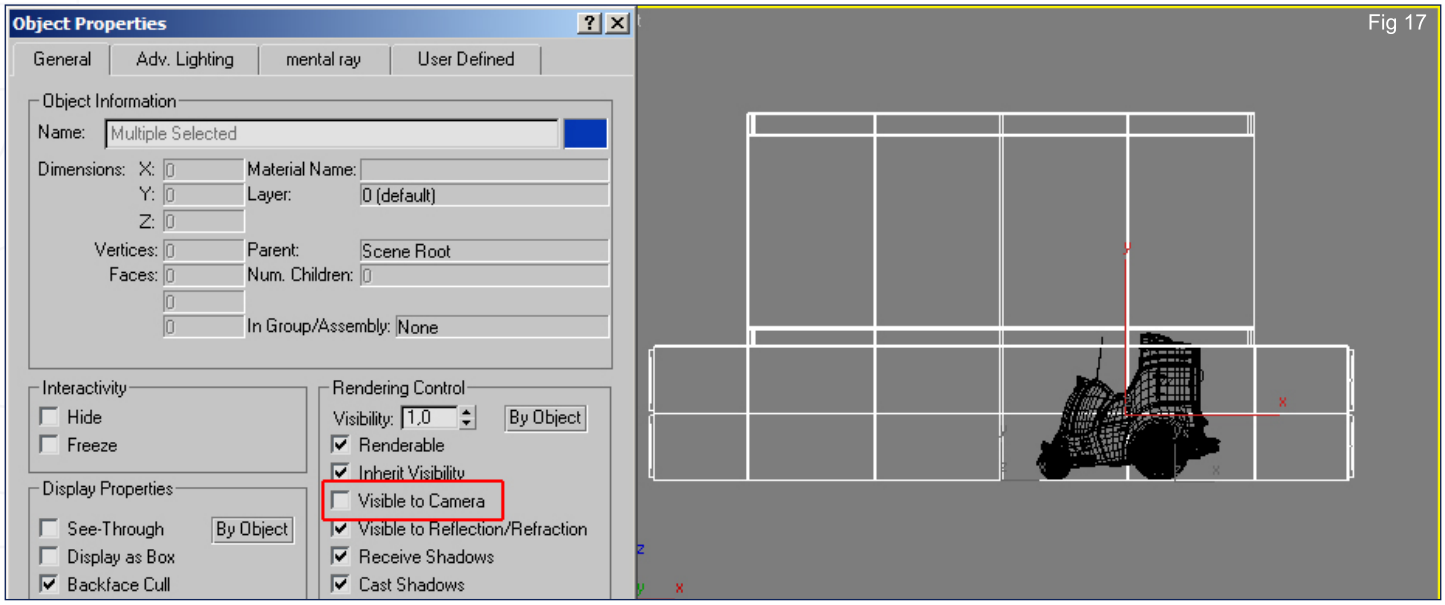


Fig 17

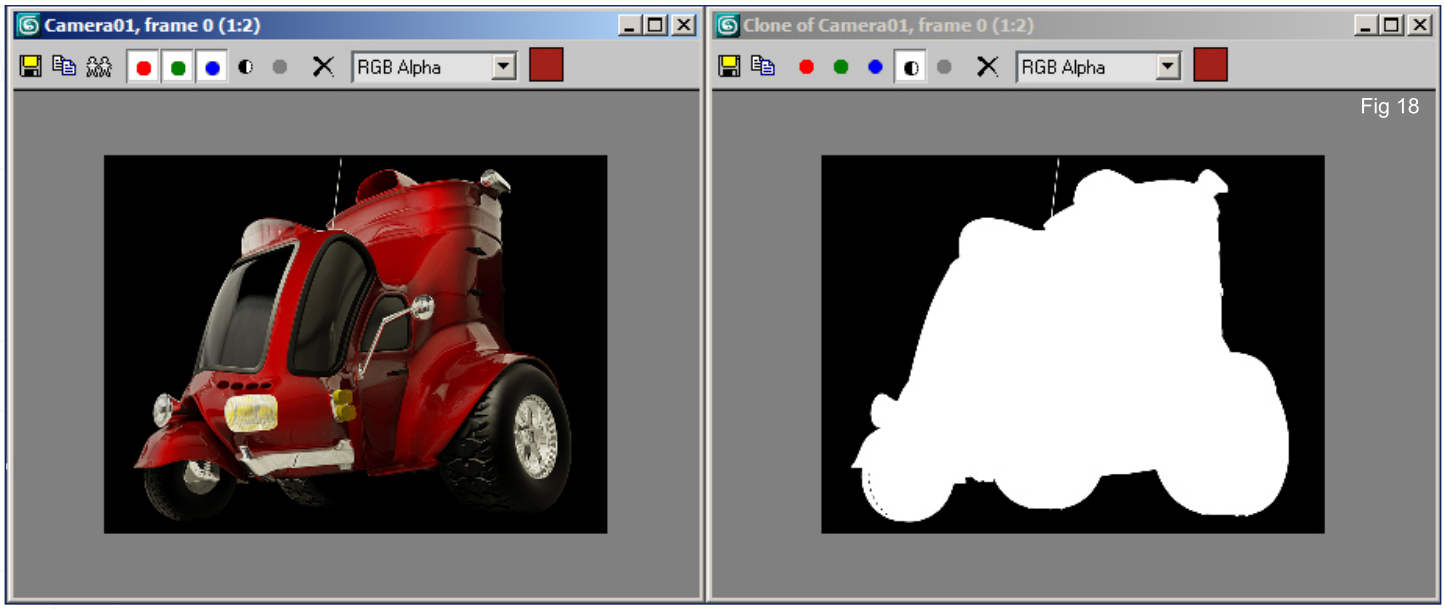
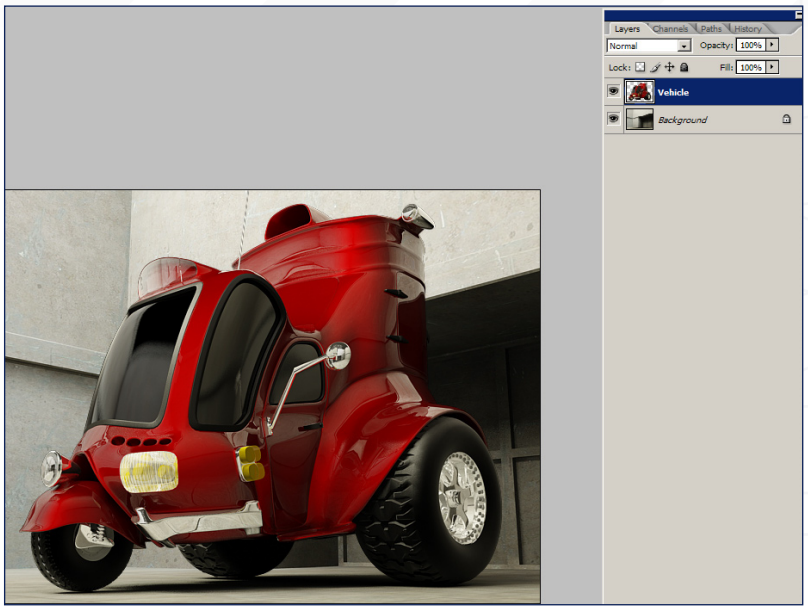


Fig 18

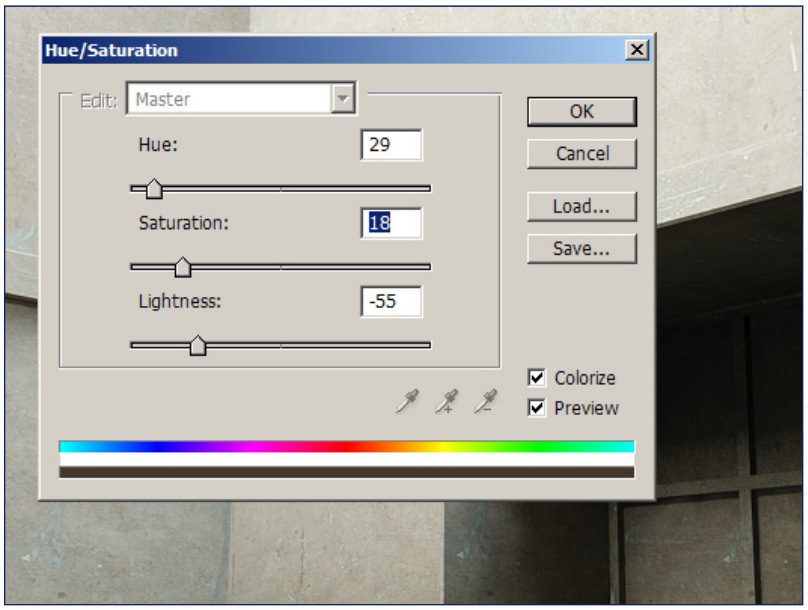
19. Now we can import the pictures in Photoshop. Put the Vehicle layer above the Background (Fig19). We now have complete control over the two separate layers; we can manipulate the look of every single aspect of the render (light, shadows, colour, exposure, and so on) and can also add some new elements.

Fig 19



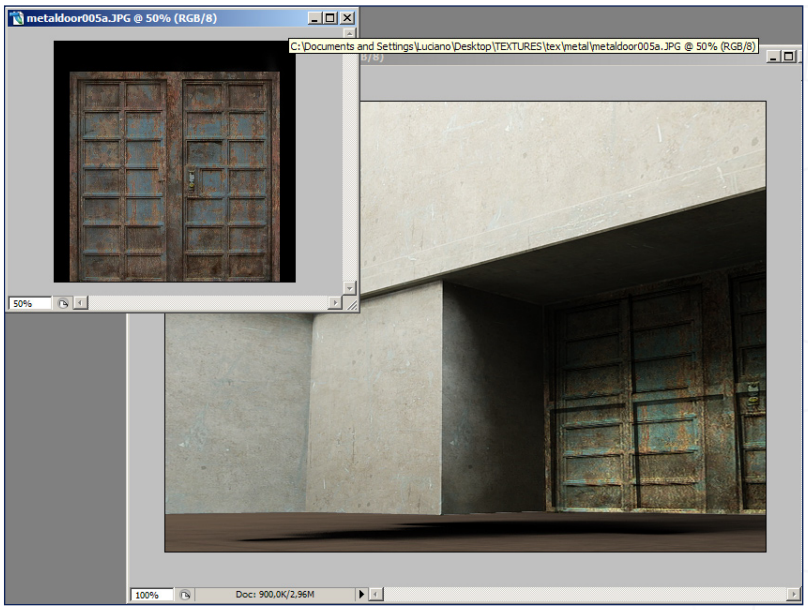
20. For example, we can change the brightness of the ground, since it's too similar to the rest of the environment. Select the floor with the Polygonal selection tool in Photoshop, and then change its colour and brightness as you feel necessary (Fig20).

Fig 20



21. Using a separate texture file, an iron door was added over the original to create more detail (Fig21).

Fig 21



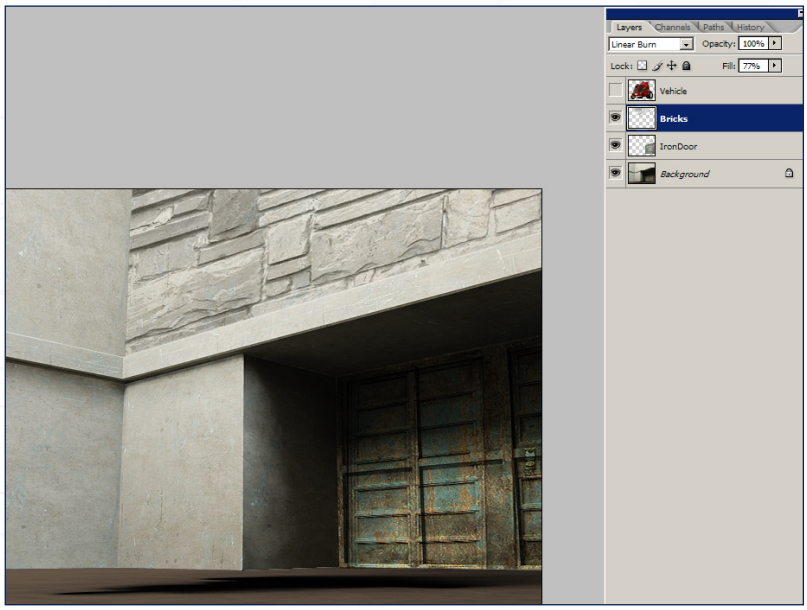


Fig 22

22. A brick layer was also added to the original render (Fig22).

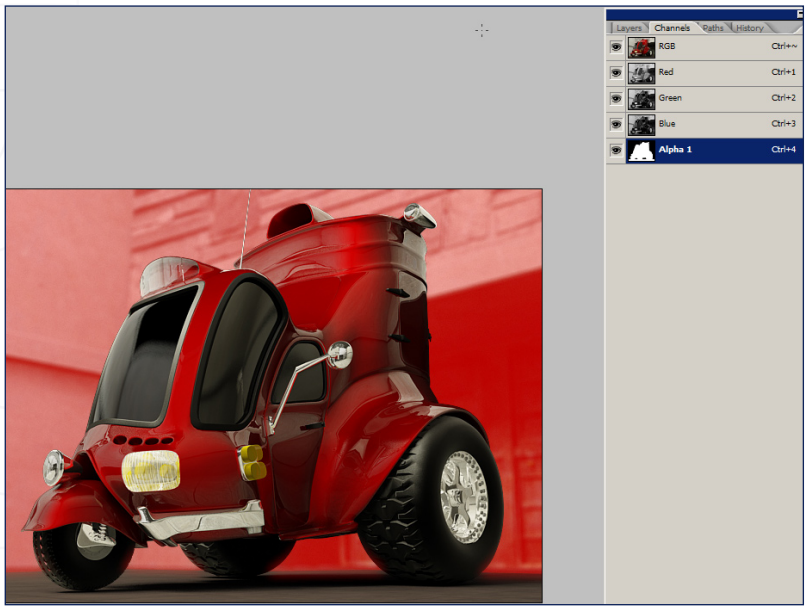


Fig 23

23. Using the alpha channel, a Lens Blur effect was used to fake the Depth of Field effect (we talked about this in the previous part of the tutorial) (Fig23).



Fig 24

24. Once you're done, flatten all the layers to have a single layer image. Now we can adjust the brightness and contrast, and the exposure, of the picture (Fig24).

25. Use Fig25 as a reference to improve the exposure of the picture.

26. If you want to, you can also add a Photo Filter effect to create a more interesting image (Fig26).

TUC-TUC

Originally designed and modelled by:

RICHARD TILBURY

Tutorial by:

LUCIANO IURINO

For more from this artist visit:

www.pmstudios.it

Or contact them:

iuri@pmstudios.it

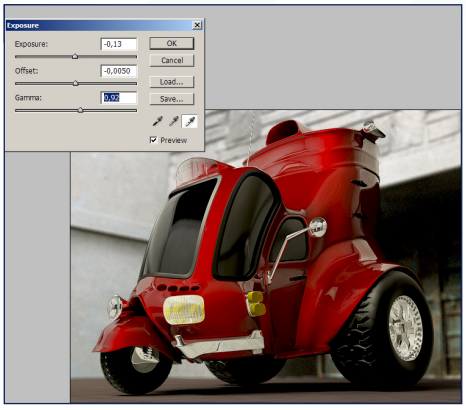


Fig 25

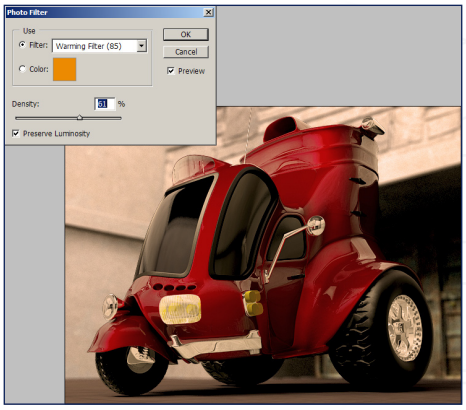


Fig 26

